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To
W. Honeywood Esq.
with the Author's kind regards.

ON
DISEASES
OF THE
BLADDER & PROSTATE GLAND.

With Plates.



BY WILLIAM COULSON.

THIRD EDITION, REVISED AND CORRECTED.

LONDON:
LONGMAN, BROWN, GREEN, AND LONGMANS.

MDCCCXLII.



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1884.

ADVERTISEMENT
TO THE THIRD EDITION.

THE demand for another edition—an evidence of the increasing attention to urinary diseases—has afforded me the opportunity of revising this work in all its parts. I have not, however, seen any reason to depart from the arrangement which I adopted in the previous editions, or to alter the views on which that arrangement is founded.

I may refer with confidence to the observations which have been contributed to the chapter on Urine; and I think the facts which are added to the chapters on Stone, and on the Affections of the Prostate Gland, will be found to increase the usefulness of the work.

*Frederic Place, Old Jewry ;
August 10, 1842.*

PREFACE

TO THE SECOND EDITION.

THE diseases of the urinary system have occupied considerable attention both in this country and in France during the last fifty years. The result has no doubt been a considerable advance in our knowledge of the nature and treatment of these affections, especially in regard to stone, its chemical composition, and the operations for its destruction or removal. Whether these diseases be more or less frequent than in former times, we have no means of ascertaining; but the authorised returns of the causes of death, which, for the first time, have assumed a shape on which reliance may be placed, show that the mortality from urinary complaints is very considerable.

It appears by the abstracts formed by Mr. Farr, and appended to the Registrar-General's first

Report, that out of 148,701 deaths, which have been certified within the six months ending 31st of December, 1837, eight hundred and sixteen are to be attributed immediately to these diseases. The cases are thus classified in the abstracts:—

OF THE URINARY ORGANS.	{	DISEASE.	MALES.	FEMALES.	TOTAL.
		Nephritis - -	37	23	60
		Ischuria - -	49	4	53
		Diabetes - -	68	27	95
		Granular Disease	2	1	3
		Cystitis - -	61	9	70
		Stone - -	161	19	180
		Stricture - -	43	3	46
		Disease * - -	262	47	309
			<hr/> 683	<hr/> 133	<hr/> 816

But the mortality, great as it may appear, affords an insufficient indication of the frequency of urinary diseases, so many of which embitter life without directly tending to its termination.

My chief object in the former edition was, to establish clearly the distinction between the inflammatory diseases which attack the several

* The head "disease" appears to include all cases of death arising from diseases of the urinary organs, not more accurately described in the returns.

coats of the bladder. It appeared to me important that these affections should not be confounded under the general character of inflammation of the bladder, as not only are they distinguished from one another by their symptoms and progress, but as each of them requires an essentially different plan of treatment.

Since the publication of my former edition, I have availed myself of the increased opportunities which have occurred to me, to follow up my investigations of the subject, and they have not in any way altered the practical conclusions which I formerly attempted to draw. I have endeavoured to render my present edition a more complete work as to the diseases of the bladder; and I have added three chapters on the affections of the prostate gland, which are so closely connected and so often confounded with those of the bladder.

London; February, 1840.

PREFACE
TO THE FIRST EDITION.

IN the following pages my chief object has been to establish clearly, the distinction between the inflammatory diseases which attack the several coats of the bladder. It has appeared to me important, that these affections should not be confounded under the general character of inflammation of the bladder, as not only are they distinguished from one another by their symptoms and progress, but as each of them requires an essentially different treatment. I have also considered Irritation, Paralysis, and some other disorders of the bladder, as they stand in close connexion with inflammation of this organ.

The substance of the chapters on inflammation, formed the subject of the oration delivered this year to the Hunterian Society.

London ; March, 1838.

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DISEASES OF THE BLADDER AND PROSTATE GLAND.

CHAPTER I.

ON URINE.

OF the excretory organs none are more important than the kidneys; none, having their functions diminished, depraved, or suspended, give rise to more alarming symptoms; none, having their structure disorganised, are attended by greater pain, or have that event followed by greater danger. In diseases of the bladder and prostate gland, the secretion of urine is often so much deranged, as to render a knowledge of the changes which it undergoes, indispensable to the successful management of these affections. I have, therefore, deemed it necessary to prefix here an account of the alterations to which this fluid is liable, and of the practical indications afforded by its various appearances, taking care more especially to point out the causes by which these changes are produced.

The urine is of a very varied and compound character, and from the abundance and variety of the matters, extracted from the body through the channel of the kidneys, the urinary system may properly be regarded as the emunctory of the entire animal economy, in which we meet with every principle and constituent that analysis has discovered, forming the solids and fluids of the body, and these in more or less proportion, according to certain modifying circumstances, afterwards to be spoken of. Indeed, no animal fluid contains so many substances dissolved in it as the urine.

So important, and indeed essential, are the kidneys to the functions of life, that we find organs either similar or analogous to them in all animals, down to the lowest grade of animated beings. Birds, amphibia, and fishes, have kidneys which are formed of one substance only, resembling the cortical of mammiferæ, without either nipples or calices^{*}; and Brugnatelli[†], Meckel[‡], and Blainville[§], have discovered an excretion analogous to urine in insects and mollusca.

Every excretory organ performs some special office: for example, the lungs clear the system of its excess of carbon, and the kidneys purify it of azote and saline matter.

^{*} V. Ferrein, in *Mém de l'Acad. des Sc. de Paris*, 1749. Galvani, *Comment Bonon.* tom. v.

[†] *Giornale de Fisica*, 1815.

[‡] *Archiv. fur die Phys.* tom. iv.

[§] *Journ. de Physique*.

To this purifying process in animals, there is an analogous function even in vegetables; for the experiments of Schuebler and Zeller* have ascertained, that vegetables which have absorbed different organic and inorganic noxious matters by their roots, get rid of them by their leaves.

Besides secreting a peculiar azotic substance, the kidneys appear to have an oxygenating power. The sulphur, phosphorus, calcium, &c. of the blood are changed into acids and oxides or earths, by the glandular energy of the kidney.

The urine of a healthy person is acid, transparent, usually of a pale amber or straw colour, a brackish taste, peculiar odour, and of a specific gravity varying from 1.010 to 1.030. Urine presents different appearances according to the time of the day at which it is passed, whether before or after a meal, and the quantity and quality of the food and drink consumed. Hence urine has been divided into two kinds, that of the drink, and that of coction or of the blood. The urine of the blood is distinguished by having all the properties of urine in an eminent degree; whilst that secreted after fluids have been taken, *urina potûs*, is limpid and tasteless, and contains, according to Nysten, only a thirteenth as much urea, and one-sixteenth of the sulphates, muriates, and phosphates of soda

* Schweigger's *Jahrbücher de Chemie und Physik*, art. v. p. 54. 1827.

and ammonia, and of lithic acid, as the urine of the blood.

The character of urine is affected by age. From experiments made by M. Rayer, and M. Guibourt, it appears that the urine of children at the breast when first voided is colourless and limpid like water, neither acid nor alkaline, and without any urinary odour. On evaporating it in a water bath, the vapour has at first an insipid smell, similar to boiled veal, which afterwards becomes distinctly urinous. According to Fourcroy, the urine of infants contains very little urea and no phosphate of lime, but is loaded with benzoic acid. The urine of a healthy child three years old, when evaporated to the consistence of syrup, forms a considerable quantity of nitrate of urea on the addition of nitric acid, in this respect differing essentially from the urine of a child at the breast, and resembling more that of an adult. According to Fourcroy, the urine of old persons contains lithic acid and the phosphate of lime in excess. M. Rayer is inclined to doubt the constancy of this occurrence, for he tested with oxalic acid the urine of three men, one aged 89, another 82, and a third 75, and that of two others in health, 43 and 42 years old: the urine of the two last became turbid at once, whilst that of the old men remained transparent.

Another material circumstance affecting the character of the urine, is the influence of the seasons as to temperature. The kidneys are excited

to greater activity in winter than in summer; nor is the reason for this difficult to be explained. All the emunctories of the body act, as occasion may require, as mutual suppositories. Now, in cold weather, the perspiration is more or less suppressed; and were it not that the kidneys evacuate the fluid which otherwise would transpire, we should be liable to plethoras, or repletions, of the most dangerous nature. Hence it happens that when the perspiration is abundant, the urine is scanty and high-coloured, containing a strong impregnation of saline ingredients; and *vice versa*, when the perspiration is checked by any cause, the urine is copious, limpid, and its proper salts more diluted.

Exercise, likewise, influences the urine, first, by augmenting and keeping up perspiration; and next, by increasing the appetite, and consequently the consumption of food: the urine, from both causes, takes on the character of the urine of the blood.

Emotions of the mind are also among those influences that manifestly impress a character on the urine; among which may be enumerated, fear, chagrin, sadness—in short, all those passions and sentiments, that suddenly or violently affect the mind. Any sudden shock produces a great increase of the secretion of urine; and in all these cases it is without odour or flavour, and consists almost entirely of water.

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The last and most important influence of all on the nature and character of the urine, is that of disease.

The art of predicting the crises in diseases by inspection of the urine, as well as their exact nature, is, in many cases, only to be acquired by long and careful observation. The physicians of antiquity made this a most important part of their study; indeed, Hippocrates seldom narrates the case of a patient without particularly noting the condition of the urine. Galen was not less observant of the various appearances of the urine in disease; and the first chapters of Alexander Trallianus are occupied with nothing else.

In modern times this essential branch of practical knowledge, founded on an attentive examination of the condition of the urine, has been almost entirely neglected; and the fact ought scarcely to excite surprise. The fraudulent, who are ever ready to take advantage of the credulity of the public, and, by playing upon their weakness, to turn it to their own profit, took up the subject of urine as a fruitful and lucrative source of imposition—they pretended to be able to distinguish a patient's disease by the bare inspection of his urine, and that too without requiring to see him. These were the Uromantes, or Urine-casters of a by-gone century, who, by their empirical conduct, soon brought into disrepute one of the most important aids, when properly employed, in the detection of disease. Uromancy thus came to be abandoned

by regular practitioners, and its employment assumed by illiterate charlatans. It is only of late years, that the obloquy attached to the practice of observing the condition of this excrementitious fluid, has been removed; and ever since the observation of the morbid changes of the urine has been based on scientific principles, this important branch of medical knowledge has regained its proper position in the estimation of every discerning practitioner. A knowledge of the urine in health, and of the variations to which it is subject in disease, is one of the bases upon which we may safely rely for much valuable information. In fact, the different appearances of this fluid may be considered as indicating, not merely different modifications of the action of the organs separating it, but also as affording correct information of changes that have taken place in other parts of the organic system, whether in consequence of the influence of some noxious cause, operating upon the whole body, or of the sympathy and reactions, that different parts exercise upon each other.

Hallé was the first to commence a work expressly on this subject: he was persuaded that the urine of persons in perfect health, underwent a multitude of changes, according to the continually varying circumstances in which they were, from time to time, placed. Nevertheless, there are phenomena common and constant under all circumstances. He further averred, that there existed in the urine of a person in health, relations

with the matters of transpiration and of nutrition, of the most intimate nature, the attentive study of which was capable of throwing great light on the nature and formation of each reciprocally.

Gäirtner of Tübingen took up this important subject after Hallé. Gäirtner observes, that the recent urine of a healthy man, is a transparent, straw-coloured fluid, which, as long as it is warm, exhales the animal odour common to all the humours newly separated from the body—an odour that shortly dissipates, and is immediately replaced by the urinous odour, properly so called. After exposure to the air for a few days, urine acquires an ammoniacal odour and an alkaline reaction, and a white slimy pellicle forms on the surface, in which, as well as on the inner surface of the vessel, small white crystals of the phosphate of ammonia and magnesia show themselves.

The colour of the urine of the blood in health varies in different individuals, from the pale straw colour, to the orange, approaching the red. As a general fact, it is to be remarked, that the colour is so much the deeper, inasmuch as the constitution of the individual is more robust, the circulation more active, and the food more of an animal nature.

The urine of persons in health is usually of a pale amber colour, becoming slightly turbid towards the centre, seven or eight hours after having been passed, and shortly depositing a sediment, that

rises up in the form of a cone from the centre of the fluid. This deposition, which at first is in small quantity, increases until putrefaction renders the whole of the urine turbid.

The colour, however, varies; and it is essential to distinguish whether the colour be owing to the food that may have been taken, or to any medicine that has been administered. Urine, for example, becomes almost colourless if much drink has been swallowed; red, after much exercise, or a paroxysm of passion, long watching, heating diet, long fasting, the use of water-cresses, beet, sorrel, and madder: it is tinged blackish by chalybeates; yellow, by saffron, turmeric, and rhubarb; and the astringent principle of galls and other substances containing tannin is evident in the urine, by its becoming of a bluish or greenish tint on any of the salts of iron being added to it. In short, no secretion is more variable in its physical attributes than urine.

The state of the body greatly modifies the quality of the urine. We know, for instance, how limpid, colourless, and watery it becomes after any spasmodic paroxysm, and in the cold stage of agues; turbid, yellowish, and mucous, at the termination of pituitous or catarrhal affections; golden-yellow, and turbid, in jaundice; turbid, accompanied with deposition of mucus, in catarrhal affections of the bladder.

Pale, limpid urine, is sometimes the consequence of indigestion, and hence we find it a very usual

symptom of dyspeptic headach; or it may proceed from constipation*, or suppressed perspiration. This limpidness of the urine is a dangerous sign in continued and intermittent fevers, and especially in affections of the brain†. In old people, the urine is usually pale, and dull and cloudy.

Colourless, limpid urine, which is like spring water, as well as inodorous and insipid, is called nervous urine.

The urine is clear and insipid, in spasmodic affections, in hysteria, hypochondriasis, and epilepsy. It is equally transparent, but usually very abundant, in diabetes.

The urine is of the colour of brick-dust, and turbid, in almost all intermittent fevers, in certain dropsies, in rheumatism, gouty affections, scurvy, atrophy, and some kinds of stone. The urine is of an orange yellow colour, or saffron yellow, in bilious diseases; but the yellowness is of a much deeper hue in symptomatic jaundice, than in critical febrile, or simple critical jaundice.

Deep yellow urine, approaching black, denotes a diseased state of the liver. Black urine, which deposits a sediment of the same colour, is a fatal symptom in acute diseases.

* Hippocrates notices this fact. In the 83d aphorism (sect. iv.) he says, "Abundant urine during the night, denotes that the bowels are not sufficiently open."

† This is another remark to be found in Hippocrates (v. Aph. 72. sect. iv.), which Celsus (lib. ii. cap. 4.) repeats.

The odour of urine is likewise often a valuable indication of the morbid condition and nature, both of the particular organs concerned in its secretion and evacuation, and of the general health.

The odour of healthy urine is somewhat aromatic, without acidity, ammoniacal smell, or fetid taint; and resembles, in a great degree, the odour of the perspiration of a healthy man.

The urine of persons affected with stone in the bladder often acquires a highly offensive odour. The urine of diabetic patients has usually a sweet wheyey smell; indeed, their whole persons exhale a similar odour.

Certain substances, when eaten, or even when respired, impart a peculiar odour to the urine. Garlic and other strong-smelling substances impart their particular odour to the urine; oil of turpentine enters the circulation by respiration, and is conveyed to the kidneys in the same way; the odorous principles of asparagus, cauliflowers, fennel, juniper-berries, valerian, castor, balsam of Peru, copaiba, cubebs, and many other substances, likewise pass through the blood into the urine.

In persons of delicate constitution, and those of a weak digestion, we can often recognise, by the odour of the urine, the nature and character of the food they have eaten. Fourcroy observes, that the urine of hysterical females, and of hypochondriacal men, passed immediately after a meal,

has smelled of bread, bouillon, and other articles of food ; circumstances attributable to the odorous molecules which had entered the blood, being afterwards excreted by the kidneys.

Another important character of urine, is that presented by the sediment it deposits : indeed, the appearance on which we can most rely is that observed in the precipitate.

Theophilus*, an author celebrated among those ancient writers who investigated the morbid characters of the urine, divided the deposit into *nubes*, *enœorema*, and *hypostasis*, according as it occupied the upper, middle, or lower part of the fluid.

When the cloud occupies the upper third of the mass of the liquid, it was thought to indicate that the mixture of the constituent principles of the urine had not been complete. When the cloud remained suspended, the older writers apprehended spasms, delirium, or metastasis.

The oily or fatty pellicle (*cremor urinæ*) that forms on urine, is a very thin and delicate film, which is sometimes seen floating on the urine of consumptive and dropsical persons, of those threatened with marasmus, or at the termination of acute fevers. Oily urine, according to Hippocrates, indicates an abscess, or nephritis† ;

* Theophilus is thought to have lived somewhere between the fourth and eighth centuries.

† Vide Aphor. 35, sect. vii.

it is sometimes seen in scurvy, calculus, and diabetes.

The discoveries of modern chemistry have taught us, that this pellicle is not in reality of an oily nature, as was formerly believed, but that it consists of a thin layer of a triple salt—the ammoniaco-magnesian phosphate.

The natural sediment of urine varies remarkably in different individuals, according to the constitution, age, sex, habit of body in respect to spareness or plumpness, the kind of labour or exercise of the individual, &c. For example, there is much more sediment in the urine of fat people who pass an indolent life, than in those individuals who are lean and work hard, or who take much exercise. There is good reason for believing, from the most recent investigations of chemistry, that the black sediment of urine is nothing but a portion of that animal oil which is formed by the partial decomposition of the urea it contains. It is an animal matter *sui generis*, composed of hydrogen, carbon, nitrogen, and oxygen, which in its natural state gives colour to the urine, and which in the case of the black sediment, is surcharged with carbon. The animal oils are, when quite pure, considered to be always colourless, and to owe their tint, from citrine to black, entirely to the progressive increase of the carbon present. In the black urine of putrid fevers, the urea entirely disappears, and serves to form this coloured animal

oil, surcharged with carbon: such urine has lost its ordinary acidity, it is sensibly alkaline and fetid, and quickly precipitates this oily matter, owing to its being specifically heavier than the liquid in which it was dissolved.

The red lateritious sediment* before the seventh day of a fever, is likewise a good sign; but if it do not show itself till after this period, it indicates long-continued illness, and in convalescence there is cause to apprehend a relapse.

A deep red sediment in pestilential fevers is considered a fatal sign, especially if the colour be derived from blood.

A mucous, viscid sediment, is often traceable to either stone in the bladder, or chronic inflammation and ulceration of its inner surface.

Pus in the sediment is often the result of ulceration in some part of the urinary organs.

The sediment in rickety people contains a large proportion of phosphate of lime†.

The sediment attendant on a state of pregnancy

* Rosacic urine, which at one time was believed to derive its character from the presence of a peculiar acid, named, from its rose-colour, *rosacic*, is now known to be only uric acid, united with a peculiar colouring matter of an azotic nature. This kind of urine prevails in acute rheumatism, intermittent and inflammatory fevers, &c. It is of a bright colour, and on standing, deposits a red sediment.

† Dr. Weatherhead, in his Treatise on Rickets, has shown that in this disease the osseous system undergoes a real decomposition, the kidneys being the emunctory by which the earthy matter of the bones is discharged.

resembles flakes of wool or cotton. This has received the name of kiestine *. It is whitish, opaline, slightly granular, and resembles very much the layer of fat which swims on the surface of fat broth when cooled. Examined by the microscope, it appears a gelatinous mass of indeterminate form. When it is cold, cubical crystals are sometimes detected. No animalcules could be discovered by Eguisier. After three or four days the urine becomes turbid, small portions are detached from the surface, and sink to the bottom, until the layer is entirely broken up. Kiestine appears to exist in the urine from the first month of pregnancy, until the period of delivery.

The late Mr. Murray Forbes † ingeniously observes, that “secretion by the kidneys has been considered as filtration ; but it is an *elective filtration*, by which fluids in mutual diffusion are separated from each other, and some permitted to pass, while others are retained. If the kidneys have not the power possessed by glands in general, of communicating new properties to fluids, by effecting a new modification of elements, they exert an admirable faculty of division, by which fluids that are blended can be withdrawn from each other, that greatly surpasses other filtration.” It is in this way that he explains the ready and rapid

* Lancette Française, Feb. 1839, p. 36.

† Treatise on Gravel, 1793.

transition of many substances from the stomach to the bladder; and he goes on to remark, in illustration, that “particular colours and odours of the urine, from very small quantities of certain matters that have been taken into the stomach, are not communicated in an equal degree to all the fluids within the blood-vessels. The matters on which they depend remain chiefly conjoined with the superabundant water, and along with it are abstracted by the kidneys. The colouring matter of ten grains of rhubarb, that gives a strong yellow colour to the urine in an hour or two after it has been swallowed, cannot be supposed to be extended in an equal degree over twenty-five or thirty pounds of fluids. If that were the case, the tinge would be of longer duration, and could not be wanting in the urine that is discharged for a considerable time: it could not vanish almost as quickly as it appeared.”—P. 34.

A very characteristic difference between the excrementitious fluids and the secretions is, that the latter contain simple organic constituent parts of definite form, or globules, as may be seen in the saliva, the pancreatic juice, the milk, &c., whereas none are to be found in the urine, the bile, the tears, &c.* This, it must be observed, is a very curious fact, and may eventually lead to the means of determining in what organic function consists.

* Tiedemann's *Physiol.* cap. viii. s. 337.

Healthy urine is always acid*; it becomes ammoniacal only by a prolonged exposure to the atmosphere; for it remains perfectly unchanged if kept in a vessel well stopped. Its ammoniacal transformation is owing to the spontaneous decomposition of the urea. It appears that this conversion may even take place in the kidneys, under the influence of disease, especially in putrid and other adynamic fevers; then the urine is alkaline as it passes from the bladder, and proportionally so as it contains less urea.

In perfect health, *the quantity* of urine passed in twenty-four hours varies even when no difference is made in the mode of living or exercise. Temperature, and a variety of causes already alluded to, influence the quantity of the secretion, and it is, therefore, impossible to fix a standard applicable to every case. Haller estimated the quantity voided in twenty-four hours to be as high as 49 ounces; Rye considered 40 ounces an average quantity in the same time; whilst Dr. Prout says that if we suppose that the quantity varies in this country from 30 ounces in the summer to 40 ounces in winter, we shall be probably very near the truth, as regards a person in

* Litmus paper is the best immediate test for detecting acidity in urine. When the urine is acid, the blue colour of the paper is changed to a red. Turmeric paper, or reddened litmus paper, is the best test for ascertaining whether urine be alkaline or not. Alkaline urine turns the yellow colour of the turmeric paper brown, and changes the colour of the red litmus paper to a blue: this latter is a much more delicate test than the former.

good health, and who does not drink more than nature requires.

The *specific gravity* of healthy urine varies in different individuals from 1.010 to 1.030. The late Dr. James Crawford Gregory* found the mean specific gravity of urine in fifty apparently healthy subjects, in Edinburgh, during the months of September, October, and November, at two o'clock in the day, to be 1.02246. Dr. Prout considers that if we estimate the average specific gravity to range from 1.015 in the winter to 1.025 in the summer, we shall be near the truth. In diabetes the gravity is sometimes as high as 1.050.

The weight of the urine can be easily ascertained by the urinometer, which is constructed on the principle of a common hydrometer. It consists of a glass tube, which at its lower extremity has two bulbs, the lower one very small, containing a heavy substance, such as mercury, and the other immediately above it much larger, and filled with air. The tubular portion contains a scale, denoting with certain figures the specific gravity, the use of which will be illustrated by the following example:—Suppose the water's edge cut the scale at figure 26, then add that number to 1000, and the specific gravity will be 1.026. In order to ascertain the quantity of solid matter in 16 fluid ounces of such urine, it is only necessary to refer to No. 1.026 in the following table.

This table was constructed by Dr. Henry, and

* Edinburgh Medical Journal, Nos. 109 and 110.

enables us to determine, without the trouble of evaporation, the quantity of solid extract contained in the pint (16 oz.) of urine of different specific gravities, from 1.020 to 1.050.

Specific gravity at 60° F.	Solid extract in a wine pint in grs.	Solid extract in wine pint in oz.
		oz. dr. scr. grs.
1.020	382.4	0 6 1 2
1.021	401.6	0 6 2 1
1.022	420.8	0 7 0 0
1.023	440.0	0 7 1 0
1.024	459.2	0 7 1 19
1.025	478.4	0 7 2 18
1.026	497.6	1 0 0 17
1.027	516.8	1 0 1 16
1.028	536.0	1 0 2 16
1.029	555.2	1 1 0 15
1.030	574.4	1 1 1 14
1.031	593.6	1 1 2 13
1.032	612.8	1 2 0 12
1.033	632.0	1 2 1 12
1.034	651.2	1 2 2 11
1.035	670.4	1 3 0 10
1.036	689.6	1 3 1 9
1.037	708.8	1 3 2 8
1.038	728.0	1 4 0 8
1.039	747.2	1 4 1 7
1.040	766.4	1 4 2 6
1.041	785.6	1 5 0 5
1.042	804.8	1 5 1 4
1.043	824.0	1 5 2 3
1.044	843.2	1 6 0 3
1.045	862.4	1 6 1 2
1.046	881.6	1 6 2 1
1.047	900.8	1 7 0 0
1.048	920.0	1 7 1 0
1.049	939.2	1 7 1 19
1.050	958.4	1 7 2 18

A ready mode of ascertaining the presence of saccharine matter in diabetic urine, is to add to it

some yeast, which gives rise to vinous fermentation, a most delicate test, as it can detect one part of sugar in a thousand parts of urine*. Every cubic inch of gas given off, nearly corresponds in round numbers with one grain of sugar—47 of gas to 45 of sugar†.

Berzelius, whose analysis of urine is deemed the most complete, describes the following substances as entering into its formation, viz., in one thousand parts of healthy urine :—

Animal and destruc- tible principles.	{	1. Water	933.00
		2. Urea	30.10
		3. Lithic acid	1.00
		4. Free lactic acid, lactate of ammonia, and animal matters not separable from them }	17.14
		5. Mucus of the bladder	0.32
Alkaline and earthy salts.	{	6. { Sulphate of potash	3.71
		—— of soda	3.16
	{	7. { Phosphate of soda	2.94
		—— of ammonia	1.65
	{	8. { Muriate of soda	4.45
		—— of ammonia	1.50
	{	9. { Earthy phosphates with a trace of fluete of lime	1.00
{ Sillex		0.03	
			<hr/> 1000.00

Besides these, which constantly exist in human urine, this fluid may contain a great number of other substances. Sugar, bile, albumen, fibrin, fat, milk, blood, pus, have all been found in urine, and the fact is interesting, insomuch as it shows

* H. Bell on Diabetes, p. 16, translated by Alfred Markwick.

† Christison, Lib. Pract. Med. vol. iv. p. 249.

how little the kidneys, when their functions are deranged, have the power of altering the character of the heterogeneous matters they separate from the system. The following is a tabular view of the matters found in the urine in addition to those specified in the above table.

- | | |
|-----|--|
| 10. | { Albumen. |
| | { Fibrin. |
| | { Red particles. |
| 11. | { Various acids, colouring matters, &c., formed from or accom- |
| | { panying the lithic acid. |
| | { Nitric acid. |
| 12. | Xanthic oxide. |
| 13. | Cystic oxide. |
| 14. | { Sugar. |
| | { Oxalic acid. |
| | { Carbonic acid. |
| 15. | Hippuric acid ? Benzoic acid ? |

Water forms the basis of blood and urine, as well as of all animal fluids; nevertheless, in the blood, it appears probable that water exists in two distinct conditions: first, as an integrant constituent of the corpuscular portion; and secondly, as diffused generally throughout the mass. It is from the latter source that the urine is taken. There is sometimes an increase of the watery portion, whilst the other principles remain the same, or become diminished. In this state of the urine, the urea and the salts bear to each other nearly their ordinary proportion, but are considerably deficient in their absolute quantity. This condition of the urine may be observed in most persons under particular circumstances, especially in the

aged; where it is only occasional, much importance is not to be attached to it. But where this state is constant it becomes an important indication, showing great weakness and debility of constitution, and is not unfrequently the precursor of serious local and constitutional mischief. Sometimes the increased flow of urine, as Dr. Prout observes, involves an increased proportion of a natural ingredient, as of urea; or of unnatural ingredients, as of albumen or sugar. On the other hand, the proportion of water is not unfrequently diminished below the natural standard, as in various forms of urinary suppression; and sometimes when the cause of this suppression is mechanical, the urine is simply diminished in quantity, while its composition remains the same: at other times, the suppression is connected with deranged action of the kidneys, and while the proportion of water is diminished, the other ingredients are relatively much increased, as in various forms of gravel and calculus.

Urea is a principle proper to the urine of man and quadrupeds, and perhaps of all animals. It was first detected by Rouelle, and afterwards more fully examined by Fourcroy and Vauquelin; it has been named *nephrene* by Dr. Thomson of Glasgow. In its solid and pure state, as obtained by Berzelius, urea crystallizes in the form of long prismatic needles, which are white, transparent, having somewhat the lustre of mother-of-pearl, with a taste approaching that of nitre, and none

at all of the fluid which furnishes it. Urea contains much azote in its composition; Voehler regards it as a cyanate of ammonia. It has been said that urea is met with in the blood of animals from which the kidneys have been extracted. Now if this be the fact, it would appear that the kidneys simply separate the urea from the blood, and do not form it.

The mode which Dr. Prout commonly uses to detect an excess of urea, is to put a little urine into a watch-glass, and carefully add to it nearly an equal quantity of pure nitric acid, in such a manner that the acid may easily subside, from its greater specific gravity, to the lower part of the glass, and allow the urine to float above it. If spontaneous crystallization takes place, an excess of urea is indicated; and the degree of excess can be inferred, nearly enough for practical purposes, by the greater or less time which elapses before the crystallization takes place, and which may vary from a few minutes to two or three hours. Such urine is commonly, but not always, of a pale colour.

Lithic or Uric Acid.— This acid invariably exists in healthy urine, and is easily detected by the addition of a little hydrochloric acid. After standing for three or four hours, a red crystalline precipitate appears, which is lithic acid tinged with the colouring matter of the urine, for the pure acid is perfectly colourless.

Berzelius supposes that lithic acid exists in

solution (in part at least) in a free state, whilst Dr. Prout doubts its existence altogether in a free state in the urine. Dr. Prout says* that Berzelius's opinion seemed to him long ago highly improbable, for the following reasons: "First, according to the analysis of Berzelius, one thousand parts of healthy urine contain, in solution, one part of lithic acid; but Dr. Henry states that one part of lithic acid requires, at 60°, at least 1720 parts of water to dissolve it. How then are we to reconcile these two statements, on the supposition that lithic acid exists in the urine in a free state? Secondly, the addition of any acid, even the carbonic acid, to the urine, as is well known, throws down the lithic acid. How is it possible to explain this fact except on the supposition that the new acid combines with something retaining the lithic acid in solution; and that the liberated lithic acid, incapable of remaining in solution, is precipitated in the solid form? Thirdly, there is no instance known in which lithic acid is secreted in a free state. Birds, serpents, &c., always secrete it in combination with ammonia; in the gouty chalkstone, lithic acid is secreted in combination with soda, &c. To suppose, therefore, that the human kidney secretes lithic acid in a free state, is to suppose an exception to a law which appears to be very general. Lastly, the lithate of ammonia exists in large proportion in human urine; for many of the amorphous sediments consist chiefly of that compound."

* On the Nature and Treatment of Stomach and Urinary Diseases, 3d edition, p. lxxiv.

When lithic acid is subjected to the action of oxygen, it is first dissolved, as is well known, into alloxan and urea. A new supply of oxygen acting on the alloxan, causes it to resolve itself either into oxalic acid and urea, into oxaluric and parabanic acids, or into carbonic acid and urea*.

Free Lactic Acid, Lactate of Ammonia, and Animal Matters not separable from them.—Berzelius regards the lactic acid as the free acid of the urine, and that it is destined to hold the earthy phosphates in solution, and probably to obviate the dire effects of their deposition in a solid mass. Dr. Prout says that in the greater number of instances of lithic acid gravel, the lactic acid is secreted in great abundance, either alone, which is comparatively rare, or in a state of combination with urea, which ordinarily occurs.

Mucus always exists in healthy urine in minute quantities, and the following are the appearances which it assumes:—After the urine has stood for some time in a tall glass vessel, the lower strata of the vessel will be found to have lost their transparency, and an exceedingly light nebulous-looking substance will be found floating in it. If collected in a filter, mucus, when moist, is always more or less transparent; and when dried, it has a shining appearance. Mucus is not coagulated by boiling, which distinguishes it from albumen; it is in great part soluble in the acetic and nitric acids, but not in the sulphuric acid; it is soluble also in caustic

* Liebig's Animal Chemistry, by Gregory, page 137.

potass. In certain states of disease, large quantities of mucus are secreted of a tenacious character, and varying in colour, sometimes white, yellow, and green, with streaks of blue.

[For the following observations on sulphur, phosphorus, chlorine, lime, and magnesia, I am indebted to my friend Mr. John T. Barry, one of the best practical chemists of our time.]

Sulphur.—No fact in chemistry is better established than the existence of sulphur in the blood: nor is its existence less certain in urine. There is, however, this remarkable difference between the two:—in the blood very little* is in the state of sulphuric acid; while in the fluid derived from that same blood and passed by the kidneys, the greater part of the sulphur is found to be oxidated to its maximum—that is, converted into sulphuric acid—and neutralized. The question then arises, Whence is the requisite oxygen supplied?

During the circulation of the blood through the lungs, one of the changes there effected is the conversion of part of its carbon into carbonic acid, which is expelled with the breath. In that case, the necessary oxygen being derived from the atmosphere in respiration and not by the skin, it might be asked whether, at the same time, there may not be a surplus of oxygen gas taken up and retained in the blood for appropriation in the glands,

* Berzelius says that none at all was found in his experiment; probably with ox blood. I found a distinct trace of sulphuric acid in human serum, though insignificant in quantity as compared with what exists in the urine.—J. T. B.

and particularly in the kidneys? The exact experiments of Allen and Pepys (Phil. Trans. 1807-8-9) ascertained a fact which decides that question. They proved that the oxygen received by the lungs is all again expired, including that portion of it which is formed into gaseous carbonic acid. The oxygen, therefore, for the acidification of sulphur within the kidney, must be derived from the blood itself; and if we may hazard a conjecture, probably from substances contained in it but of no further use in the animal economy. But the decomposition of these substances, by the abstraction of part of their elementary oxygen, must convert *them* also into new compounds. In this way, possibly, that highly azotized body, urea, may be formed; for it seems improbable, in a healthy condition of the glands, that a substance of excrementitious character should be created immediately from the albuminous portion of the blood, unless in cases where albumen is formed in excess.

I have been thus minute regarding the conversion of sulphur into sulphuric acid in its passage through the emunctories, because the same kind of change doubtless extends to some other elementary bodies that exist in the urine.

It has been a controverted question, (whether certain animal fluids, and among the rest, I believe,) whether urine contains sulphur in any other state than that of sulphuric acid. Berzelius was the first to show that it does, because after acidulation

with muriatic acid, and precipitation with muriate of barytes in very slight excess, and then decanting the clear supernatant liquid, there still remains in perfect solution some combination of sulphur; which may be detected by evaporating to dryness along with nitrate of barytes, and incinerating the residuum. In that residuum, sulphate of barytes was discovered by Berzelius. The experiment, I find, may be advantageously varied, by substituting pure nitrate of potash for nitrate of barytes, before the incineration. The ash being afterwards dissolved in a few drops of water acidulated with muriatic acid, yields with muriate of barytes a precipitate, which is the sulphate: not a mere trace, but an appreciable quantity.

This requisite destruction of the organic matter, for the purpose of detecting the last portions of sulphur, applies equally to the analysis of blood, in which even the iron otherwise escapes the action of chemical reagents. It was on that account that Berzelius inferred that these and several other substances in the blood exist in some state unknown to us, and certainly not as salts. Engelhart combated the opinion of Berzelius, by showing that these various bodies might be detected without incinerating the blood, provided it were acted upon by chlorine. But to me it appears that the chlorine may liberate oxygen to oxidize the sulphur, iron, &c., by seizing upon the hydrogen of the organic matter, or even of the water. Indeed, this is so obvious that it is almost a wonder it should have

escaped those writers who adopt the views of Engelhart*.

Phosphorus.—This element of the urine—unlike sulphur—exists only in the state of acid, that is, oxidated to its maximum : at least, it has not been found in any other state in healthy urine. The acid is but partly neutralized by the bases present.

The connexion of phosphorus with the animal economy is interesting, because it forms an essential constituent of the earthy part of bone, fully four-fifths of which consist of phosphate of lime. It is the phosphate of lime, too, which, becoming deposited within the bladder, forms one species of urinary calculi. There is another urinary calculus in which the phosphoric acid is combined with magnesia and ammonia, usually called the “triple phosphate”; and sometimes both these phosphates are present in the same stone, constituting a third species, denominated the fusible calculus. The formation of these particular deposits is attributed to a deficiency of free acid in the urine.

Chlorine.—Chlorine, as such, is never developed in animal bodies. Where it exists in them, it is usually in combination with sodium, forming common salt;—but sometimes also, in minute quantity, with potassium, forming the chloride of that metal. It also exists in union with hydrogen and ammonia, forming common sal-ammoniac. All these neutral combinations are held dissolved in

* When writing the above, I was not aware that Gmelin, in opposing Engelhart, had offered a similar suggestion.—J. T. B.

the urine, and never constitute morbid deposits; because, neither with lime, with magnesia, nor with any other elementary substance present there, does chlorine form an insoluble precipitate. If, however, free muriatic acid—of which chlorine is an elementary part—be habitually evolved within the stomach, as in dyspepsia, one of the consequences may be the formation of calculi or gravel, by the precipitation of the lithic acid which the urine should retain in solution.

Lime.—If to urine, deprived by filtration of its vesical mucus, an excess of caustic ammonia be added, a very bulky precipitate is thrown down. This precipitate (besides a minute quantity of ammonio-phosphate of magnesia) contains the lime in union with phosphoric acid. The supernatant fluid, if evaporated to dryness and incinerated, will be found to yield no more lime: whence it is obvious that if, according to Berzelius's experiment, calcium exists in blood in some other state than lime, this metallic base must become oxidated during its excretion by the kidney.

Lime is a principal constituent of several kinds of urinary calculi, two of which have been already mentioned. There is a third, the oxalate of lime, or mulberry calculus. Where it does not result from the peculiar character of the food, the occasion of this morbid deposit is the formation of oxalic acid in the living body; possibly from some undue oxidation of carbon within the kidney. So strong is the affinity between lime and oxalic

acid, and so great the insolubility of the resulting compound, that the addition of a very minute quantity of oxalic acid occasions in the urine a precipitate of oxalate of lime ; because the oxalate, unlike the phosphate of this earth, is not (or at least, not to the same extent) soluble in the natural acid of the secreted fluid.

Magnesia.—It is but in small proportion that this earth is found in urine, from which it is precipitable in the state of ammonio-phosphate, along with the phosphate of lime, on the addition of ammonia. A portion, however, of the magnesia remains some time longer in solution ; such is the case when the carbonate of ammonia is employed. If, therefore, immediately after the addition of this reagent, the fluid be filtered, and then allowed to remain two or three days, there will form a few sparkling crystals of the ammonio-phosphate of magnesia. After removal of the magnesia from the solution, no more of it can be discovered by evaporation and incineration. No magnesium, therefore, exists in urine, except in an oxidized state.

Magnesia, like lime, in combination with phosphoric acid, is one of the constituents of bone earth ; but it forms a very small part. As before stated, it is also a principal ingredient of certain urinary calculi, into two species of which it enters. These are the “triple phosphate,” or ammonio-phosphate of magnesia ; and the fusible calculus, consisting of that salt and the phosphate of lime.

I shall now say a few words on albumen, pus, and blood, matters which are only found in urine in its unhealthy state.

Albumen.—Albuminous urine contains much less urea than healthy urine, and in these cases it is that urea is found in the blood. This kind of urine is not characterised by any particular physical appearance; it often is of a natural colour, sometimes a little pale, at other times it is obviously tinged with blood. For the most part, albuminous urine is transparent at the instant it is voided, but on cooling it becomes turbid; its odour is ordinarily less urinous than the urine of health. The tests for detecting albumen are various. Nitric acid is one of the best; for if a few drops be added to the urine containing albumen, a precipitate is formed, which we cannot re-dissolve by an excess of the acid, but which is readily dissolved by the addition of a sufficient quantity of an alkali. Heat, from its property of quickly coagulating albumen, is an excellent test for recognising this principle, as it has the advantage of not coagulating the other elements of urine. Albuminous urine, on being exposed to a temperature of about 150° , becomes opaque, and deposits the principle in a coagulated state. The precipitate varies considerably in appearance in different instances, being sometimes firm, and similar to that formed by the serum of the blood, from which it may then be supposed to be derived; while, at other times, it is delicate,

fragile, and somewhat resembling curd, when it may be supposed to be of chylous origin.

When albuminous urine is alkaline, it is sometimes incapable of being coagulated by heat. It was supposed that this depended on the presence of some fixed alkali, holding the albumen in solution. Mr. Rees made an analysis of two different specimens of urine taken from the same individual: one was neutral, and coagulable by heat; the other was not so coagulable, and was capable of alkaline reaction. From analysis, it appeared, that the alkaline specimen contained a greater proportion of albumen, and a much smaller proportion of alkaline salts, than the neutral urine. This goes strongly, he observes, against the probability of any fixed alkali being the solvent of the albumen; for in this case we should expect a redundant quantity of fixed saline matter in proportion to the albumen present, whereas exactly the opposite was the result. The bichloride of mercury, alcohol, tannic acid, and infusion of galls, have been employed as tests for albumen, but they cannot be depended on. The objections to the bichloride are, that it precipitates mucus as well as albumen, and that it decomposes some of the salts of the urine, and both alcohol and the infusion of galls precipitate the clouds soluble by heat, as well as the albumen.

Pus is often found in great abundance in the urine. Upon standing, the pus subsides to the bottom of the vessel, in a state more or less pulverulent, and the fluid resumes its transparent

character. If in urine pus be present as well as mucus, the former is found lying on the latter, and presents a much yellower tint; it is also quite opaque, whereas mucus is more or less transparent*.

A ready test for determining whether the deposit from the urine be of a purulent nature, is, after pouring off the clear supernatant urine, to add liquor potassæ to the sediment collected in a phial or test tube. If it be purulent, it will, on agitation, form with the alkali a transparent viscid compound.

Mr. Brett† says, that "urine containing pus will almost invariably be found of a pale colour; it will be found sometimes acid, at others alkaline; and although somewhat, is not nearly so prone to undergo decomposition, as is observed in some of the worst forms of the phosphatic deposit. If urine of this character be allowed to remain at

* As an ordinary and easily available mode of ascertaining the nature of urinary sediments, none, perhaps, is better than that mentioned by Mr. Rees (*On the Analysis of Blood and Urine*, p. 144). "When," he says, "we observe a deposit, concerning which we are in doubt, the sedimentary matter can be extemporaneously examined by shaking it up in the urine, and then applying heat to a portion of the turbid fluid; if the sediment dissolves, we may at once conclude that it consists of the alkaline lithates, and for the most of lithate of ammonia. If, on the contrary, the action of heat fails to render the urine clear, we may be pretty sure that we operate on phosphates, or organic matter in the form of pus or mucus. These may be easily distinguished, since the phosphates are at once dissolved on the addition of muriatic acid, whereas the latter substances resist this acid."

† *London Med. Gazette*, vol. xvii. p. 924.

rest, the purulent matter subsides after some time, having a greenish-yellow tint, which is highly characteristic of it. This deposited matter is ropy, and capable of being, in some cases, drawn out into threads. When thrown upon a filter it appears in the form of a perfectly opaque coagulum, of a greenish-yellow colour, very different from ordinary mucus, as found in the urine.

“ The urine from which this deposit has taken place will be found to be invariably albuminous, coagulating by heat and by nitric acid. Tincture of galls, corrosive sublimate, and alum, all cause either a precipitate or manifest turbidity. This albuminous impregnation of the urine depends, I believe, on the serous portion of the purulent matter being diffused through the urine, the deposit consisting of the insoluble opaque particles, mixed with a larger or smaller proportion of mucus.”

Blood is often poured out in abundance from the mucous membrane lining the urinary passages, and is generally diffused through the urine, or is passed entire. In other cases small quantities of blood are passed, mixed with pus or mucus, or alone, after the urine has been voided. When large quantities of blood are passed, especially without pain, it is probably a simple exudation from some part of the mucous surface of the urinary organs ; on the other hand, when the blood is mixed with pus or mucus, and passed with pain, it denotes ulceration of the kidney or blad-

der, and may be combined with the existence of a foreign body in the bladder.

Dr. Willis, and other writers, quote several authorities to show that hæmaturia is endemic in some countries. M. Chapotain*, for instance, informs us that in the Isle of France children from their earliest infancy are liable to hæmaturia, without suffering any pain from it, or its appearing to prejudice their general health. M. Salesse†, a native of the Isle of France, and now a practitioner of medicine there, states that three-fourths of the children are affected with hæmaturia at one time or another. In these cases the bloody urine is generally observed to alternate with that which is chylous or oleo-albuminous. During the invasion of Upper Egypt by the French, many of the men suffered from an epidemic hæmaturia‡.

* Typographie Méd. de l'Isle de France. Paris, 1812.

† Diss. sur l'Hématurie, Thèses de Paris, 1834.

‡ Renoult, Notice sur l'Hématurie, &c., in Journ. Gén. de Méd. tome xviii.

CHAPTER II.

IRRITABILITY OF THE BLADDER.

THIS term is usually employed to denote any affection of the bladder attended with frequent desire to void the urine. I wish, however, to express by it, a frequent, and often irresistible, desire to micturate, not arising from inflammation, nor any of the organic affections, of the bladder or prostate gland, and sometimes, but not always, attended with pain. The frequent desire to micturate, is the chief symptom of this complaint.

Thus, a person previously enjoying good health, feels, suddenly, a desire to void urine every half-hour, or oftener; and the desire is so strong, that, unless he yield to it at once, the urine passes in spite of all attempts to prevent it; or, if he succeed in checking the desire, uneasiness, pain, or even paralysis of the bladder, is apt to occur. In this disease the act of micturating is sometimes, but not always, attended with pain in the glans, or under the frænum, and with violent efforts or straining.

The urine, except in hysterical subjects, is voided in small quantities; and although such quantities are frequently passed, their aggregate does not much exceed that of a person in health.

Hysterical persons sometimes suffer from irrita-

ble bladder, and experience great pain in passing urine. In these patients, the quantity of urine is often considerable, and possesses the aqueous character, or contains less than the usual proportion of solid matter, the nature or relative quantity of its constituents remaining the same. This peculiarity in the quantity and quality of the urine in the hysterical, as well as the often concomitant irritability of the urinary system generally, is capable of explanation perhaps, to a certain degree, from the fact that the viscera apt to be deranged in hysteria, all derive nerves from the same source, namely, the abdominal ganglionic system.

Opportunities for examining, after death, the bladders of persons who labour under idiopathic irritation of that viscus, are exceedingly rare. I examined the body of a gentleman, of very nervous temperament, who had long laboured under this affection, and who was carried off by disease of the lungs, but I could not detect the least alteration in the appearance or structure of the bladder, or any of the urinary organs.

After long-continued irritation, the bladder diminishes in size; and instead of containing a pint or more, it is incapable of holding above two or three ounces. Notwithstanding this contracted state, if there be no stricture or disease of the prostate, the parietes of the bladder are often thinner than natural. It would therefore seem that long-continued irritation produces actual absorption of part of the substance of the bladder.

Where a case of irritability of the bladder comes under the notice of the surgeon, the first and great object of inquiry is, the cause on which the irritation depends.

Irritation of the bladder often depends on obvious causes ; as pressure of the womb in pregnancy, hæmorrhoids, and foreign bodies in the bladder. In almost all cases of stricture, the bladder is liable to irritation ; but, if there be no alteration in the structure of the organ, the irritation subsides when the stricture is removed. After the operation for stone also, the bladder often remains irritable.

Sometimes the slightest derangement in the digestive organs, by disturbing the functions of the kidney, causes irritability of the bladder. Adults, and children more particularly, are, from eating fruit, very liable to this affection in the summer season : in these cases, the urine contains an excess of acid, either lithic acid, or lithate of ammonia ; and we are further to recollect that the malic, citric, and other vegetable acids, are conveyed to, and excreted by, the urinary organs, unchanged by any process of digestion or sanguification.

Sometimes irritation is produced by taking alkaline remedies for too long a time ; and, in this case, the urine is alkaline. I was consulted for irritability of the bladder by a gentleman, whose urine was alkaline, but whose appearance and state of constitution did not at all lead me to expect that state of urine. On inquiry, I found that for

a long time he had been taking the sesquicarbonate of soda in large doses. I ordered him to discontinue its use, and he soon recovered. The altered state of the urine being the immediate cause of this irritability, the condition of that secretion should especially engage our attention.

Many gouty and rheumatic persons are subject to this complaint. It often occurs that a patient having irritability of the bladder, applies to his medical man, who, on inquiry, finds that he is occasionally subject to pains in the limbs and loins, to some scaly eruption on the skin, and sickness of a morning, as well as that the urine is usually passed in small quantities, is very acid, and contains a large quantity of the lithate of ammonia.

The following case illustrates this common form of the disease:—On the 11th of February, 1837, a gentleman, forty-two years of age, and subject to rheumatism, applied to me, on account of a very frequent desire to pass urine, from which he had suffered for several years. He was affected with a scaly eruption, of a leprous nature, on several parts of the body, particularly about the elbows and knees; and he often felt severe pains in the hips and loins. The urine was very acid and scanty. I ordered him the following mixture:—℞ Infus. Diosmæ ℥xv.; Tinct. Hyoscyam. ℥iij.; Potass. Bicarb. ℥iss.; Extract. fluid. Sarsap. ℥iv.; Cap. coch. ij vel iij ampl. ter in die. I gave also the following pill at bed-time; ℞ Pil. Hydrarg. gr iij; Pulv. Rhei gr ij. On the 3rd of March, the irri-

tability of the bladder was much lessened, and the eruption improved. I then gave the decoction of the *pareira brava* in the day, with a grain of the acetous extract of *colchicum* at bed-time. His complaint was much relieved, but not cured.

Remarkable irritability of the bladder and urethra, with increased secretion from the mucous membrane of these parts, prevails with some persons shortly before a fit of gout; and these symptoms almost always take place when the urethra is affected with stricture.

During the most frequent symptoms of the paroxysm, says Sir C. Scudamore *, “the urine is usually passed with considerable irritation, both as to frequency and sense of heat. The pink or lateritious sediment appears, more or less, in every portion of the urine, during the inflammatory symptoms. When these have entirely subsided, and the state of the liver (on the condition of which the symptom in question principally depends) is still remaining unhealthy, the sediment of the urine often assumes a whitish colour, and is compared by the patient to the appearance of *magnesia*. This and the pink sediment frequently alternate, one or the other appearing as inflammatory or nervous action most prevails. Sometimes, however, it occurs that a patient who has for years been labouring under irritability of the bladder will have this symptom relieved or suspended during a paroxysm of the gout.”

* On Gout, Gravel, and Rheumatism, p. 18.

Scybala in the intestines may give rise to this complaint. I have already assigned a reason why there should be not only a sympathy betwixt the bladder and the other viscera of the pelvis, by which the diseases of one may be mistaken for those of the other; but certain parts of the *primæ viæ* through their whole extent, sometimes the stomach, sometimes the ileum, often the colon, and still oftener the rectum, being the seat of irritation, produce sensations in the bladder, the perineum, or urethra, which fill the mind of the sufferer with serious apprehensions, and lay him open to the mistakes of ignorance. It ought never to be absent from the surgeon's consideration, when a patient complains of frequent micturition, pain in the bladder, and pain in the perineum, that these symptoms very frequently depend, neither on stone, nor stricture, nor inflammation, nor any mischief in these parts, but on remote irritation.

Irritability of the bladder is sometimes the result of a mere nervous state of the organ, of the same spasmodic nature as that which in other individuals, and other parts, occasions a constant winking of the eyes, or twitches of the muscles. The frequent voiding of the urine, being once begun, is kept up by habit; the bladder becomes less capacious; and it is not until after some time, nor without some effort on the part of the patient, that it is restored to its natural condition and capacity. Various mental affections, as grief and anxiety, cause this com-

plaint; and it is often connected with a peculiar state of the nervous system.

I have known irritation supervene on paralysis of the bladder. Several years ago, a gentleman, during an attack of typhus fever, was seized with inability to pass urine, requiring it to be drawn off twice a day. As he gained strength the power of micturating returned, and the desire to pass it then became so frequent as to compel him to do so every half-hour, for which he consulted me. There was no disease in the urinary organs, and his general health was good, with the exception of occasional rheumatic attacks. The urine was very acid and scanty. I ordered him a grain of the acetous extract of colchicum at night, and ten grains of bicarbonate of potash, seven of sesquicarbonate of soda, and four of nitrate of potash, twice or three times a day, soon after meals; and by these means the urine became more abundant and less acid; but the frequency of passing it continued. I tried the infusion of diosma, the decoction of the pareira brava, and various preparations of steel, for the relief of this symptom, but without success.

In children, a not uncommon cause of irritability of the bladder, is a contracted state of the prepuce. A striking case of this kind came under my notice some time ago. Master Charles B., æt. seven years, was sent to me by Mr. Huxtable of St. John Street. The child had, for the last eight months prior to my seeing him, complained of a frequent desire to make water, attended with difficulty in

passing it, and pains round the lower part of the abdomen. On examining the prepuce, I found it so contracted as scarcely to admit the point of a probe. I immediately removed the end of the prepuce by circumcision. From that time the symptoms subsided, and the child is now quite well. In these cases, the division or removal of the extremity of the prepuce will be sufficient for the cure of the complaint, without the aid of medicine.

Irritability of the bladder may, in many cases, be mistaken for some of the inflammatory affections of this organ. The distinction, however, is easy, and of great practical importance. If the disease have recently occurred, it may be distinguished from acute inflammation of the bladder, by the absence of pain and of those severe constitutional symptoms which characterise the latter disease. If it have been of very long standing, it may be distinguished from chronic inflammation of the bladder, by the general health suffering but little; whereas, in chronic inflammation, the constitutional powers sooner or later give way.

The cause of irritability is sometimes supposed to be confined to the bladder, when in fact that organ is not at all affected, and the kidneys are the source of the complaint: these cases are attended with great obscurity.

Morgagni * relates a case in which the bladder was thus the seat of sympathetic pain; the disease

* On the Seats and Causes of Disease, Letter 42.

being in the kidneys. The patient, he says, complained of very little pain in the region of the kidney; while he was tormented with pain in the bladder, so excruciating, that five or six physicians who attended him, entertained no doubt of the seat of the disease being in that organ. On dissection, however, no morbid appearance was discovered in the bladder; and there were large and ramifying calculi in the kidney.

Morgagni* also relates a case mentioned by Harder and quoted by Bonet†, of a child three years of age, paraplegic, and affected with convulsions, who suffered most acute pain in making water, but had never complained of pain in the region of the kidneys (at least Morgagni presumes so). After death the bladder was found to be healthy, but a large quantity of sand could be pressed out of the mammillæ; and at the commencement of the ureter there was an oblong pointed stone of great hardness, and very adherent to the parietes of this canal. Lowdell‡ mentions the case of a woman, twenty-two years of age, who suffered pain in the region of the bladder, but yet she had complained of none in the region of the kidneys. The calices of both kidneys contained large and very irregular calculi. Lastly, Mr. Howship§ relates a case of pain in the neck of the

* Epist. cit.

† Sepulchretum, lib. iii. sect. xxvii. obs. x.

‡ Mem. of Med. Soc. London, vol. i. obs. 24.

§ Practical Treatise, &c. on some of the most important Complaints that affect the Secretion and the Excretion of the Urine, p. 40.

bladder, with frequent desire to make water, which fluid contained a thick mucus. On post-mortem examination of the body, the bladder was found to be in a perfectly healthy state; the right kidney, which had also been the seat of pain, was transformed into a purulent sac.

M. Rayer* quotes the above cases to show the relation which exists between calculous pyelitis and irritability of the bladder.

Cases of irritable bladder, says Dr. Prout †, “depending on functional derangements of the kidneys usually result from the unnatural properties of the urine. Healthy urine, however heterogeneous and stimulating in its properties, and however deleterious its action may be when brought into contact with the living textures of the body in general, constitutes, nevertheless, the natural and proper stimulus of the renal and vesical cavities. All deviations, therefore, from the normal condition of the urine, whether in deficiency, in excess, or in kind, are recognised by the containing organs, and may prove a cause of feeling—in other words, a source of irritation in the kidney and bladder. Hence, whenever the urine is very dilute or very concentrated; or is preternaturally acid, or alkaline; or contains any unnatural ingredient; the urinary organs in general, and the bladder in particular, though perfectly healthy, are liable to

* *Traité des Maladies des Reins*, tome 3ième, p. 92.

† *On the Nature and Treatment of Stomach and Urinary Diseases*, 3rd edition, p. 391.

become excited and irritable, and the individual has no peace until the unnatural secretion be discharged. In such cases, the fault lies, not in the bladder, but remotely in the kidneys and assimilating organs; and in this mode, and to this extent, the bladder may occasionally become irritable in all individuals at all ages; but in the young and healthy, such irritation is temporary only, and subsides with the operation of the causes." Even where the urine is not very unnatural, the pain is confined chiefly to the neck of the bladder; but when the urine is actually diseased, and more especially when it is alkaline, we may be certain that the kidney is functionally, and if the patient be of scrofulous habit, and the case of long standing, very probably organically, affected *.

In idiopathic irritability of the bladder, which has not been of long continuance, the treatment is usually plain; the state of the general health and the condition of the urine being our guides. In gouty and rheumatic subjects, in whom the urine is generally acid and scanty, and red sand is often passed, the alkalies should be administered; and a good form for their exhibition is a combination of potash, soda, and nitre†. The carbonate of potash is to be preferred to the carbonate of soda,

* Some interesting cases of irritation of the bladder, caused by disease of the kidney, are related by Mr. Henry James Johnson in the *Medico-Chirurgical Review*, vol. xxix. p. 193.

† R̄ Bicarb. Potass. ℥j; Sesquicarb. Sodæ, ʒvj; Potass. Nitrat. ʒij. As much of this powder as can be put on a sixpence, to be taken twice a day, in water, soon after a meal.

because, under certain circumstances, soda enters into combination with the lithic acid, forming an insoluble salt, as bad as that acid itself: whereas the lithate of potash is perfectly soluble, and if this combination should take place, it passes off dissolved in the urine. In addition to the alkalies, the acetous extract of colchicum, in doses* of one or two grains, should be given at bed-time; and if the digestive powers be weak, as is often the case, some tonic, as infusion of cascarilla, or columba, or hop, a short time before meals, will be found serviceable. Great relief will sometimes be obtained from cupping on the perinæum, and from the warm bath, with the internal use of the liquor potassæ and tincture of hyoscyamus, and occasional doses of the blue pill and saline aperient. When we can trace the irritable state of the bladder to mischief in the kidney, setons and issues in the lumbar region must be employed in addition to the means immediately directed against the sympathetic disease.

In these, and indeed in all cases, the strictest attention should be paid to diet. Vegetables and fruit should be avoided, as well as wine, spirits, and all fermented liquors.

In some constitutions, notwithstanding the acid state of the urine, and the deposition of a large quantity of the lithate of ammonia, the alkalies disagree, producing restlessness, giddiness, and

* R Extract. Aceti Colchici, gr. j vel ij; Pulv. Glycyrrhizæ, q. s.
A pill to be taken at bed-time.

uneasiness about the region of the stomach. I have seen many cases of persons who had great irritability of the bladder, and whose urine was very acid, and deposited great quantities of the lithate of ammonia, but who could not bear even small doses of alkaline remedies *.

If the patient be of a nervous temperament, and the urine be alkaline, a different plan of treatment will be necessary. The dilute mineral acids†, combined with the decoction of *pareira brava*, should be administered, and everything having a tendency to lower the system, as attention to business, study, or anxiety, should be studiously avoided.

In other cases, where the urine is neutral, the extract of the *Uva Ursi*‡, combined with that of *Hop* or *Hyoscyamus*, may be taken, and opiate suppositories§, or injections, with some drops of the *Liquor Opii Sedat.* according to the severity of the symptoms, may be administered. The decoc-

* In such cases, the following mixture may be given :—℞ Spirit. Ammon. Aromat. ʒ ij; Spirit. Æther. Nit. ʒ ij; Tinct. Hyoscyam. ʒ ij; Mist. Camph. ʒ v. A fourth part to be taken three times a day.

† ℞ Acid. Nitric. dil. ʒ i; Acid. Muriat. dil. ʒ ss; Aquæ distillat. ʒ viij. Two table-spoonfuls to be taken three times a day.

‡ Extract. *Uvæ Ursi* gr. v. Extract. *Humuli vel Hyoscyam.* gr. iij. Two pills to be taken three times a day. The acetous extract of *Colchicum*, or the muriate of *Morphium*, may be added to this formula; the former, if there be rheumatic pains in the limbs; the latter, if there be much irritability of the bladder.

§ ℞ Pil. Saponis cum *Opio* gr. viij. To be introduced within the rectum at bed-time.

tion of *Uva Ursi* *, and the infusion of wild-carrot seeds †, will occasionally give great relief. In my experience, however, no medicine has been so often successful in irritability of the bladder, as the *Diosma* in the form of infusion ‡. I could cite several cases where it has succeeded after other medicines had failed. A young gentleman, æt. 21, applied to me in May, 1834, on account of an affection of the bladder; and said that, for the last eleven or twelve years, he had experienced great difficulty in retaining his water for any length of time, being obliged to leave all company in which he might be, once or oftener in the hour. The moment the desire to micturate came on, the water, unless the desire was immediately complied with, passed away involuntarily. This irritability of the bladder was always very much aggravated after taking malt liquors, wine, spirits, and on exposure to cold, and, during the last twelve months, it had considerably increased. He was very susceptible of cold, complained of pains down the inside of the thighs, but had no pain in the region of the

* *R Folior. Uvæ Ursi* ʒi, *Aquæ ferventis* ʒxx; coque ad ʒxvi. A third part of a pint to be taken three times a day.

† *R Seminum Dauci Contusorum* ʒi, *Aquæ ferventis* ʒxvij; *Macera* per horas iv; dein cola. A third part of a pint to be taken three times a day.

‡ This is to be prepared according to the formula in the London Pharmacopœia. If there be scaly eruptions, and the urine be very acid, the following form will be of service: *R Infus. Diosmæ* ʒvij; *Potass. Bicarbon.* ʒi; *Tinct. Hyoscyam.* ʒiiss; *Extract fluid. Sarsap.* ʒiv. Two table-spoonsful to be taken three times a day. If the urine be not very acid, the alkali must be omitted.

loins on pressure, nor any over the bladder, and his general health had not suffered. The urine was light-coloured and neutral in its character. After trying the various preparations of steel, the decoction of *pareira brava* and henbane in different forms, without success, I ordered the infusion of *diosma*, which he took for some time with great benefit.

From time immemorial, the Buchu leaves have been held in great esteem by the natives of the Cape of Good Hope, as a remedy for a number of diseases, particularly irritative or chronic inflammatory affections of membranous parts, as the urethra, bladder, prostate gland, rectum, and also for rheumatism, indigestion, and gravel. Of late years, these leaves have been very successfully prescribed in the same complaints, both in Holland and in this country. There are several species of this shrub, but that termed "*Diosma crenata*" is most esteemed for its medicinal virtues. It affords, on distillation, an essential oil, resembling a mixture of oil of rue, juniper, and camphor: the extractive matter is slightly bitter and mucilaginous. The natives of the Cape, and the Dutch, who have learned from them the use of the plant, are partial to the spirit of buchu, made by distilling the leaves in the dregs of wine, which they term buchu brandy; and they regard it as a sovereign remedy for all chronic, and even for acute diseases, of the stomach and bladder, especially spasms in the stomach and intestines.

Mr. Jesse Foot, as is well known, was a great advocate for injecting the bladder in cases of irritation of that organ ; but the plan, since his time, has never been extensively tried. Mr. Wadd, indeed, mentions two cases in which great relief was experienced from the *lotura vesicæ*, and expresses his surprise that it is not more resorted to by practitioners.

The bladder may be injected with simple tepid water, or with some bland mucilaginous decoction, as of quince seeds, linseed, &c., and the injection may be repeated once or twice a day, the quantity thrown up being gradually increased, and the time of retaining it lengthened.

I have myself tried the injection of the bladder in cases of simple irritability, and I have been disappointed in the results which I expected from its use. It is certainly a valuable remedy in an affection of the bladder to be noticed hereafter ; but I do not consider it of much use in the complaint now under consideration.

In the irritability of the bladder which is met with in young females at the time when menstruation should take place, or when some irregularity in that function has occurred, the preparations of iron are of great service. The ammoniated or the muriated tincture of iron, given in some light bitter infusion, is found serviceable ; and if the bowels be costive during the use of the remedy, the compound decoction of aloes should be daily administered. The bowels should be kept well

open, for the symptoms of the disease are invariably aggravated when the bowels become costive. If there be much hysteria, the tincture of valerian, combined with the vinum aloes, may be also tried with benefit. The cold shower-bath will likewise be found very serviceable in such cases.

In children, incontinence of urine usually depends on an excitable state of the bladder, or an altered condition of urine. In either instance, the bladder cannot contain more than a trifling quantity of urine before the call to void it is felt, and this is so sudden and irresistible, that it must be obeyed, or the contents are at once expelled. In some cases it occurs during sleep, and the urine often passes off involuntarily, under the influence of a dream.

CHAPTER III.

PARALYSIS OF THE BLADDER.

THIS is the opposite state of the bladder to that which has just been considered, although one is sometimes consecutive of the other.

Partial paralysis of the bladder, in which a quantity of urine flows from it which is insufficient perfectly to empty it, may exist for some time without exciting attention.

When more complete paralysis supervenes, and the patient has not lost all sensibility, he complains of great uneasiness and oppression or weight in the region of the bladder, and he finds himself incapable of voiding urine, notwithstanding all his efforts to do so.

The principal uneasiness appears to arise from the pressure of the urine against the parts at the neck of the bladder, and the pain is referred there and to the glans penis: as the distension increases, these symptoms go off, and the patient does not even experience an inclination to void urine. This arises from the bladder having lost its sensibility, so that pressure is no longer felt, although the bladder is now pressing backwards upon the rectum, and forwards against the abdominal muscles. The local symptoms have in a great measure subsided; others come on, showing

the constitution to be much disturbed ; there is a quick pulse, great thirst, general irritation, anxiety of mind, the tongue is covered with a brown fur, and the patient becomes delirious, with intervals of stupor. Under these symptoms the patient sometimes dies, and is not uncommonly believed to have been carried off by typhus fever, totally unconnected with the disease of the neck of the bladder.

This affection falls most frequently under the notice of the surgeon as the effect of injuries or diseases of the spine ; and these cases are attended with important changes in the whole urinary system, as well as in the condition of the urine itself.

In some cases, the urine first secreted, though free from mucus, and of an acid quality, has an offensive and disgusting odour. In other cases the urine is highly acid, has an opaque yellow appearance, and deposits a yellow amorphous sediment. But the most common change produced in the urine by injury of the spinal cord, is the following :—it is voided turbid, and of ammoniacal odour ; when allowed to remain at rest and to cool, it deposits much adhesive mucus ; and, when tested with reddened litmus or turmeric paper, it is found to be highly alkaline : after some time, a quantity of phosphate of lime may be detected in the mucus, and it is tinged with blood : at a later period, a considerable quantity of sanguineous coagulum is blended with the mucus and urine.

An opinion has been entertained that, in these cases, the ammoniacal condition of the urine is owing to imperfect nervous power influencing the kidneys, and that, consequently, even at its source, there is a change in the secretion of urine.

If this opinion be correct, little relief can be afforded, excepting in so far as the paralysis itself may be relieved. If, on the contrary, the evolution of ammonia, and the inflammation of the bladder, be the effect of the retention, the prospect is more cheering.

Lallemand remarks*, that we must ascribe to diminution of sensibility, the distension of the bladder and the inflammation of its mucous membrane, observed in disease of the brain and its membranes, when such disease is accompanied with stupor, drowsiness, &c. In that case, the patient makes no effort to expel the urine from the bladder, because he does not feel the impression made by it: it consequently accumulates and distends the parietes of that organ as long as they admit of it, until their resistance being greater than that of the neck of the bladder, the urine dribbles away as slowly as it is conveyed by the ureters, that is, drop by drop.

This complaint often attacks elderly persons, particularly those who are gouty and rheumatic. It is the result of general diminution of nervous and muscular power; the bladder being less sensible to the stimulus of the urine, and being incapable

* Letter II. p. 236.

of obeying the will with the same facility as before.

Paralysis of the bladder is peculiarly, as Soemmering observes, a disease of old age—the excitability of the organic formation, particularly that of the muscular fibres, gradually decreases; the susceptibility of the nerves becomes limited, and the cellular membrane loses its tone. Hence, an attack of paralysis is often long announced by weakness in the loins, tottering in the step, and bending of the knees in walking. From this it may almost always be inferred, that a considerable alteration in the functions of the spinal marrow, and of the nerves proceeding from it and from the sacrum to the bladder, has taken place.

The bladder is rendered incapable of obeying the will with the same facility as before: no longer so susceptible of the customary excitement of the urine, it yields to the urine, and becomes distended, sometimes to an enormous size, even so much as to burst, when the patient almost immediately expires. Haller saw a bladder in a great drinker, which was able to contain twenty pounds' weight of water. Frank found the bladder so distended as to give the appearance of dropsy; twelve pounds of urine passed at one time through the catheter, although he did not remove the whole of it.

Baillie remarks that this expansion of the bladder may arise from an accidental circumstance, where the urine accumulates whilst the muscular

coat still retains its peculiar power ; or the muscular coat of the bladder may likewise be paralysed, and hence be incapable of expelling the urine. The difference between these two circumstances can always be ascertained by an examination of the case during life.

In advanced age, the muscular power of the bladder is liable to be impaired in a greater proportion than that of some other muscular parts. Two evils, apparently of opposite kind, yet both referrible to impaired action of some of the fibres of the bladder, occur as sources of great inconvenience and distress. One is retention of urine, from debility of those muscular fibres by which it is usually expelled, and the other is the incontinence of the bladder, arising from paralysis of its sphincter ; or, as those who deny the existence of any sphincter would say, from loss of tone in the urethra.

The first indication of failure in the muscular power of the bladder, is the inability to empty itself wholly, some urine always remaining behind, after every attempt at expulsion. If, from any accidental circumstance, the urine has been suffered to accumulate in too great a quantity, its expulsion becomes still more difficult, and may even be found to be impossible, without the introduction of the catheter.

After the bladder has thus been stretched to an excessive degree, its tone is much impaired, and is with difficulty recovered ; and even if the power of

retention to a certain extent be obtained, this power may be accompanied by incontinence when the quantity is exceeded; the urine continuing to come away involuntarily, while there is still a considerable quantity retained in the bladder.*

Children are likewise subject to both partial and complete paralysis of the bladder. In some cases, the urine continues to pass involuntarily by day as well as by night; and then the patient suffers more or less from this complaint during the remainder of his life. When this occurs only in sleep, children should be waked up in the night, twice or oftener, for the purpose of passing urine; and they should not be permitted to take late meals, or much liquid for some time prior to retiring to rest. Indeed, they should not at any time be allowed to take much liquid. As lying on the back in bed tends to keep up this complaint, it should be guarded against. Cold bathing, preparations of iron, and other tonics, are of great use. This complaint usually improves as children get older, and often disappears after puberty, owing to the increased energy which the genito-urinary organs then experience. If it continue after puberty, the tincture of cantharides is often very serviceable, together with the occasional application of blisters across the sacrum or loins.

M. Lallemand † strongly recommends the use of

* Cyclopædia of Practical Medicine. Article—AGE, by Dr. Roget.

† Archives Générales de Médecine, Mars 1827.

baths, medicated with aromatic plants ; and mentions several cases which were cured by using them. After eight or ten baths the beneficial effects are usually observed, and fifteen or eighteen generally suffice for the cure. Sometimes the complaint returns after a few months ; if so, the baths must be again resorted to.

I have known this state to occur after an attack of scarlet fever. A boy, now seventeen years of age, was quite well till ten years ago, when he was attacked with scarlatina ; and ever since that period he has been afflicted with incontinence of urine during the night.

Incontinence of urine is frequently connected with a weak and scrofulous state of constitution ; and often, in these cases, all remedies are unavailing. I saw sometime ago a child, six or seven years old, with a large head, pale countenance, bad teeth, prominent sternum, large abdomen, and emaciated extremities, who, from its earliest infancy, had suffered from incontinence. All kinds of remedies had been tried without success. In this case, as in many others, there was great irritability of the bladder during the day, and, unless the desire to pass urine was attended to, it flowed off involuntarily. The urine was very acid.

In incontinence of urine, it is of the utmost importance to preserve the patient from the consequences of a perpetual dribbling of the urine. For this purpose, a receptacle should be worn during the day to contain the urine as it is passed.

The contrivances in ordinary use, composed of gum-elastic, are objectionable, on account of the strong urinous smell which they soon acquire, notwithstanding every attention to cleanliness. An oval glass bottle or vessel composed of copper or platina, and covered with a piece of thin macintosh, is better adapted for persons labouring under this complaint. These contrivances are made for females as well as males. During the night patients should have a piece of macintosh cloth placed under them.

In some persons, particularly in stout females, the urine will flow involuntarily on lifting a weight, or coughing, or any violent exercise. In such cases, there is no pain, no blood in the urine, no desire to make water often, but merely an involuntary flow on exertion—the action of the diaphragm and abdominal muscles overcoming that of the sphincter of the bladder. In females, incontinence often occurs after distension of the urethra for the extraction of calculi or foreign bodies, and occasionally after difficult labours. Dr. Cory relates a rather interesting case of the latter, which speedily yielded to one-sixteenth part of a grain of strychnia, given three times a day*. In these cases, it is probable that the sphincter vesicæ has been injured.

In the end of gestation, incontinence of urine is not uncommon, being produced by the pressure of the uterus on the bladder, by which the urine is

* Med. Gazette for March 16th, 1839.

expelled involuntarily, whenever the woman coughs or moves quickly: at least, she cannot retain much of it, being obliged to void it frequently, though without strangury. For this complaint there is no cure; and many regard it favourably, as an omen that the child's head is resting on the os uteri. When the uterus is very pendulous, some advantage may, in this respect, be obtained, by supporting the belly with a proper bandage, attached to the shoulders.

Incontinence of urine, resulting from a mere weakness of the neck of the bladder, is common in those who have had very large families, ten or twelve children, for example. In these cases, more especially if the child is large, or the pelvis small, when the labour has been severe, the bladder is apt to get so infirm about the neck, that it loses much of its retractive power, and, perhaps, from the moment of delivery, the woman is incapable of retaining the water: or if, at any time, she chance to cough, laugh, rise suddenly, or in any other manner contract smartly the abdominal muscles, the water comes gushing away. For years this disease may continue with greater or less severity, but it frequently cures itself, in good measure, and the first few weeks after delivery, say at the end of the fortnight, the patient is better; at the end of the month the retentive powers are still more increased; and in the course of a few more weeks, she becomes able to hold the water very well, though still liable to gushes, when sudden efforts are made. Hence,

where inconvenience is the result of an enfeebled cervix vesicæ, time must be looked upon as one of the principal remedial means; in some cases, advantage may be obtained from plunging the hips into cold water two or three times daily. The improvement of the general health is by no means to be neglected, for the more you improve the general health, the more you will increase those healing powers of the parts on which all cures are more immediately dependent *.

Paralysis of the bladder is also frequently brought on by neglecting to expel the urine when it has accumulated. A person, not being conveniently situated for emptying the bladder, may neglect the first call, and allow the bladder to become distended; the elongated fibres lose more and more their sensibility; the desire perhaps goes off; a large quantity of water accumulates; the retention, which at first was only partial, becomes complete; the bladder rises up to the umbilicus, or even higher; and when he attempts to empty it, he finds that he is unable to do so, and that he cannot void any water at all. In this case, the detrusor muscle has lost its power, and the urine cannot be discharged by the patient, though no obstruction exists. We are further to recollect, that the other power that so mainly assists in the evacuation of the bladder, I mean the action of the abdominal muscles, is counteracted in its effects by the abnormal position of the bladder. Though all the

* Vid. Blundell's Lectures, Lancet, 1828, p. 673.

muscles of the abdomen assist by their contraction in the expulsion of the urine, still this is more particularly accomplished by the compression made immediately over the bladder by the hypogastric sections of the recti muscles. Now, when the bladder through distension, rises as high as the umbilicus, any contraction of these sections, instead of pressing the urine downwards against the sphincter vesicæ and overcoming its resistance, pushes the urine in an opposite direction, from the axis of action being changed. Patients, therefore, ought never to resist the first desire to make water.

When the bladder is distended to a certain degree the urine will sometimes flow off involuntarily ; and it has happened, at this stage, that the paralysis has been overlooked, especially in corpulent persons, and incontinence has been supposed to exist, whilst in reality, the bladder was full and could hold no more. In the case therefore, of a person who complains of not being able to hold his water, and especially in that of an old person, in whom the water is flowing off involuntarily, the surgeon ought not to give any opinion till after he has laid the hand upon the abdomen, and felt whether the bladder be distended or not ; for very serious consequences may be produced by a mistake in this respect.

In illustration of this important point, Mr. Lawrence states the following case :—" It happened to me, a good while ago, to be sent for, to see a gentleman labouring under an affection of the

bladder; and the medical attendant, who had lately seen him, mentioned that the case was one of great irritability of the bladder, which would hold no water at all—the urine passing off as fast as it came into it. He said he had been doing all he could to get the bladder's natural power of retention restored; he had directed the patient to take diluent liquids; in short, he had done all he could to prevent it; but still the water ran off. It appeared to be a singular case. I put my hand under the clothes upon the abdomen; and I felt the fundus of the bladder forced up a good way above the umbilicus. I said that I had brought a catheter with me, and that I might as well introduce it, to see if there was anything in the bladder. I introduced it; and about five pints of urine immediately flowed off. The bladder had been, in this way, allowed to distend for about five days before I saw the patient; and the consequence was, that he never afterwards recovered the natural power of emptying that viscus; but he acquired, after a certain time, the art of introducing the catheter, which he still employs: he can introduce it, and let off the water whenever he finds a desire to do so; but since that time he never has been able to empty the bladder by the natural powers."

If, by the use of the catheter, the bladder should happily recover its natural power, the patient must be strongly impressed with the importance of never again allowing the urine to accumulate in such a

quantity, but of immediately passing it as often as he feels the smallest inclination, or, if unable to expel it, of making timely use of the catheter. The patient ought also to be informed of the necessity, on every occasion, of voiding the urine even to the last drop.

Although the complaint is often met with in old persons, it not unfrequently occurs in others who are under thirty-five or forty years of age, and whose constitutions have been impaired by venereal excesses, long courses of mercury, anxiety, fatigue, and excessive attention to business. Before the attack, the patient complains of pain in the head, or some part of the back, weakness in the loins, and inability to walk firmly, flatulence, or a sense of fulness in the epigastric region, and he feels and looks as if threatened with some impending mischief. If these symptoms be not relieved, paralysis of the lower extremities follows; and the bladder partakes of the affection. I attended, with Mr. Ireland, of Artillery Place, a case of this kind, which in eight weeks terminated fatally. From the commencement of the illness, the use of the catheter twice, or occasionally three times a day, was required. At first, the urine was of a deep red colour, very acid, and without mucus; but towards the close of the illness, mucus was secreted in abundance, and the urine became alkaline.

I have known, however, paralysis of the bladder to occur where the previous habits were regular,

and the state of health was in other respects good. With Mr. Dunn, of Norfolk-street, I attended a gentleman about thirty years of age, extremely nervous, who had been labouring under considerable mental excitement. We were sent for to this gentleman, suddenly, on account of retention of urine. The urine was drawn off by the catheter; and this was repeated twice a day for ten days; at the end of which the power of the bladder returned, and he was able to make water himself. The retention arose entirely from a paralysed state of the bladder, owing to diminution of nervous power: there was no stricture, nor gonorrhœa, nor local impediment to the passage of the urine.

The bladder is an organ easily deprived of its power of contraction; for, in typhus fever, some cases of compound fracture, and severe injuries of the lower extremities, we often find that the bladder becomes paralytic, and that the water must be drawn off.

Mr. Hunter* observes, that when the bladder, from whatever cause, has been distended so considerably as to have its contractile power destroyed, there is considerable extravasation of blood from the inner surface of that viscus, so that the water which is evacuated is often extremely bloody; and he alludes to cases where the patient has died with this obstruction upon him, and in which the inner membrane of the bladder has been almost black, from being loaded with extravasated blood; but

* Palmer's Edition of Hunter's Works, vol. i. p. 287.

this symptom of bloody urine goes off as the bladder again acquires its power of contraction.

In the case of a lady on whom I operated for hæmorrhoids, the bladder became paralysed, and she required the use of the catheter for some days before it recovered its usual power.

Paralysis of the bladder has occasionally occurred from the use of opiate suppositories, or injections; so that it has been necessary to draw the water off, and much alarm has been occasioned by it.

I may allude to a few of the causes which may deprive the bladder of the power of expelling the urine, although it cannot, under such circumstances, be said to be in a state of paralysis.

The rectum may be distended by flatus, blood, morbid growths, or a foreign body; and, in these states, the neck of the bladder and the urethra may be compressed.

I attended, with Mr. Brown of St. Mary Axe, a case of diseased Hip Joint, in which matter had made its escape from the affected joint into the pelvis, so as to press on the neck of the bladder, and had caused paralysis of that organ. On examination, after death, I discovered, that the matter had escaped through the acetabulum to the posterior part of the bladder, and had made a lodgement close to its neck.

Children, whilst labouring under whooping-cough, and at the time of dentition, are liable to retention of urine. Joseph Wm. Brett, æt. two years and a half, whilst labouring under whooping-cough, was

seized with inability to pass urine. Two days before, the mother had, on three occasions, observed some blood in the child's urine, and some red sand deposited in the urinal. A small catheter was introduced, and a pint of urine drawn off. After twenty-four hours, this operation was again repeated, and the functions of the bladder gradually returned.

There are two periods in pregnancy* when women are especially exposed to retention of urine, about the fourth month, and at the time of confinement. To have the more exact idea of this state, it must be recollected, that, in the first month, the womb continues, as before conception, in the depth of the pelvis; that it does not ascend above the cavity until the fifth month, and sometimes even later; that till that time, its size and weight having progressively increased, it even descends towards the vagina, and, in the manner of a wedge, presses posteriorly the rectum, and anteriorly the neck of the bladder, and the urethra against the symphysis of the pubes, to such a degree, as to stop the opening of that canal.

The displacements of viscera, which most frequently give rise to retention of urine, are retroversion of the womb, and prolapsus of that organ, or of the vagina or rectum. If we examine the connexion of the bladder both with the womb and vagina in the female, and with the rectum in the male, it is evident that these parts cannot be dis-

* *Traité des Maladies des Voies Urinaires*, par J. P. Desault, p. 160.

placed without drawing with them the bladder; and that, in such displacement, whatever may be its contractile force, it cannot entirely expel the urine it may contain.

In the prolapsus and retroversion of the womb, and prolapsus of the vagina and rectum, the posterior part of the bladder, instead of being carried upwards and forwards, must be drawn downwards and backwards, and the curve of the urethra must be entirely changed. Instead of presenting a concavity beneath the pubes, as in retroversion, the bladder presents there a convexity, a derangement which must not be lost sight of in the introduction of the catheter.

A case is recorded by Mr. Coley * of retention of urine caused by imperforation of the hymen. A young lady, aged sixteen, had been ill three days and nights, with retention of urine; and her medical attendant had been under the necessity of relieving her by the introduction of the catheter, twice daily, during that period. The cause of the ischury was found to consist of an imperforate hymen, which, by totally preventing the discharge of the menstrual fluid, had produced a mechanical obstruction in the urethra. The external orifice of the meatus urinarius was situated in a cul-de-sac, and the hymen was tense and slightly protruded. The patient being laid on her back, a double-edged scalpel was passed through the hymen, which was very thick and tough, beginning at the upper

* Lancet, 1833, p. 395.

part just below the meatus. Nearly four pints of tar-like fluid gushed out; after which the incision was continued down to the perineum. An aperture was thus made capable of admitting two fingers, into which a plug of lint was introduced; at the end of two months she was cured.

In performing the operation of dividing the morbid vaginal membrane, great circumspection is requisite, as death has been the consequence in several instances. De Haen, in the sixth part of his *Ratio Medendi*, mentions a misfortune of this kind, occasioned by the operator having carried his incision, by mistake, into the bladder; and Denman lost a patient from peritonitis produced by the operation. Parsons* mentions the case of a young woman, of seventeen, with imperforate hymen, who had retention of urine from the lodgement of the menstrual fluid in the vagina. When allowed to proceed without relief, the disease has terminated in death. An instance of this kind is recorded by Dr. Schmiedt†, in which the stagnant urine, accumulated in the vagina, eroded the passage and made an opening into the rectum, which proved fatal; the patient being only eight years old.

The morbid appearances presented after death from paralysis are, dilatation of the bladder, at-

* Parsons on the Bladder, p. 8.

† *Miscellanea curiosa Medico-Physica Academiae Naturæ Curiosum, sive Ephemeridum Medico-Physicarum Germanicarum. Annus tertius, p. 198.*

tenuation of its coats, and a pale white appearance of the mucous membrane; these, at least, are the appearances found when the kidneys and the mucous membrane of the bladder have not been seriously involved in mischief, as after injuries of the spine. In the latter case, there is great vascularity of the mucous membrane lining the bladder, ureters, and the pelvis, and infundibula of the kidneys; the mucous surface of the bladder is thickened, of a slate colour, and presents, here and there, dark red spots; and sometimes it is covered with phosphate of lime, deposited from the mucus, or a white powder is found in the mucus itself, and the bladder contains some foetid urine.

In the treatment of this disease, the first and immediate step required, is to draw off the accumulated urine by means of a catheter; and the operation should be repeated at least three or four times in the twenty-four hours * (at intervals sufficiently short to prevent over distension), until the bladder has recovered its contractile power. In some cases, however, less disturbance will arise from allowing the catheter to remain in the bladder than is produced by the repeated introduction of the instrument.

As full a sized catheter had better be used as the urethra will admit; and, if blood is present, it

* The usual recommendation is to draw off the urine *twice* in the twenty-four hours, but this practice is much too seldom. Few people evacuate the bladder, in health, less than four or five times within the same period; and it is especially incumbent on us to relieve the bladder, at least, as often as nature herself does.

must not only be full-sized, but longer by four or five inches than those usually employed: in old people a large instrument is also necessary, as it develops the calibre of the urethra, the parietes of which, at this time of life, are soft and flaccid. In retention of urine in old people, the bladder frequently ascends above the pubes, and elongates the urethra, which consequently demands a catheter somewhat longer than those in ordinary use.

The curvature of the catheter must be proportioned to that of the urethra, or, at least, in relation to the period of life; the curve increases from infancy to old age, being greater in the adult than in the infant; whilst the urethra is most curved in those who are far advanced in life, which is caused by the increase in depth of the symphysis of the pubes. In ordinary cases of retention, I prefer a full-sized silver catheter, mounted on a rough ebony handle, or a gum-elastic catheter, made of such materials as will enable it to retain its shape. The catheter being well oiled and slightly warmed, the patient stands with his back against the wall or a table, or he may lie in the horizontal position, which is preferable to the former, with the legs and thighs flexed and slightly separated; while the surgeon stands on the left side and introduces the instrument, with the concavity of it towards the abdomen and pubes; it is then propelled gently onwards, through the urethra, till the point has arrived beneath the symphysis of the pubes. The surgeon then depresses the handle of the catheter

between the thighs of the patient, and imparts to it a slight degree of pressure, or impulsion, to make it enter the bladder, otherwise the beak, in place of passing under the symphysis of pubes, will strike against the sub-pubic ligament. This pressure should be very slight; if possible the weight of the instrument ought to be sufficient for the purpose.

When it is necessary to pass the female catheter, it is of consequence to be able to do it readily, which is by no means difficult. The patient ought to be placed on her back, with her thighs separated, and the knees drawn a little up. A basin is next to be placed betwixt the thighs, or a bladder may be tied firmly to the extremity of the catheter to receive the urine. The labia and nymphæ being separated with the finger, the instrument is to be conveyed gently down the fossa under the clitoris, that leads to the orifice of the urethra; this is easily distinguished, as an irregular depression just above the entrance to the vagina, and higher or lower from its orifice, according as the vagina is in its natural state or retracted. The point of the instrument is to be moved lightly down the fossa after the finger, and it will readily slip into the urethra. It is finally to be carried on in the direction of the axis of the outlet of the pelvis, and the urine drawn off.

The catheter may also be readily introduced by placing the point of the finger just on the orifice of the vagina, and the instrument being then

glided along the finger, it either at once, or by the slightest motion upward and downward, slips into the urethra.

This operation ought always to be performed in bed; and the patient is never to be exposed.

In cases of fractures, bruises, &c., where the woman cannot turn from her side to her back, the catheter may be introduced from behind without moving her.

When the bladder is turned over the pubes, as happens in cases of great deformity of the pelvis, it is sometimes requisite to use either a flexible catheter, or a male catheter, with its concavity directed forward.*

If the passage of a catheter is required in cases of prolapsus and retroversio uteri, the operation is conducted in a different manner from what has been just described. As in these affections the fundus of the bladder is drawn downwards and backwards, there is a corresponding change in the curve of the urethra, the concavity of which is directed towards the rectum; from such a change of position, it is evident that the convexity of the catheter should be directed to the pubes; the operator will find it more advisable, in such cases, to use the gum-elastic catheter than the silver one. A contrary effect is produced on the urethra during parturition. If the process is tedious so as to require the urine to be drawn off,

* Principles of Midwifery, by John Burns, M.D. Ninth edition, page 43.

the operator will find the urethra increased in length, and rendered more curved, in the natural course, as the bladder is forced above the pubes by the foetus and uterus, which in this way accounts for the elongation of the canal *.

In paralysis of the bladder dependent on disease or injury of the spine, the catheter should be passed with the greatest care, so as, on one hand, to avoid injury to the mucous membrane, and, on the other, completely to empty the bladder.

On this subject Sir C. Bell makes some good observations :—" When the case is one of injury of the spinal marrow, and paralysis is the consequence, you must," he observes, " be especially careful in passing the catheter in these cases. You must pass it slowly, gently, with every possible attention and precaution, and avoid anything like that dexterity, which by French authors is called

* A very ingenious improvement in the female catheter has been made by Dr. Montgomery, Professor of Midwifery to the School of Physic in Ireland : instead of closing it with a plug, he has substituted a stopcock, and has also adapted to the bell of the catheter a moveable silver cap, to which a fine bladder is attached ; the instrument thus armed, is introduced into the female bladder, the cock is then turned, and the urine flows from one bladder into the other ; after being filled it is removed from the catheter and emptied ; the catheter remaining *in situ*, and as the cock is closed no urine flows, till the cap and bladder are again applied, which is then ready to receive it. This most comfortable contrivance prevents all exposure of the patient for the application of a urinal, no change of posture is necessary, nor admission of cold air to the patient, which is often very dangerous. It also prevents the necessity of frequent introduction of the instrument.—*Edin. Med. Surg. Journal*, vol. xxix. p. 325 ; also, Hargrave's *Operative Surgery*, p. 431, et passim.

tour de maître. It is especially necessary that you should be cautious in these cases, because there is no sensibility of the part, and you may twitch the instrument, and thereby make an abrasion of the membrane, or so injure the urethra as to lay the foundation for a false passage. Now, it will be found that when a false passage is made, or there has been a rupture of the urethra, and the point of the catheter has gone out of the urethra, there is the greatest probability, in introducing it again, that you hit upon the false passage, the edge of the ruptured part being so apt to catch the point of the catheter, and direct it out of the urethra."

These are points of the greatest importance, which, perhaps, have not always been sufficiently attended to in practice.

Cases are on record in which abscesses in the bladder and ulcerative perforations have been the result of the point of the catheter coming in contact with the bladder.

I need scarcely observe, that if, from any circumstance, as impermeable obstruction of the urethra or enlargement of the prostate, the catheter cannot be introduced, the life of the patient must not be endangered by delay: the bladder must be punctured.

In some cases of paralysis of the bladder, in which the urine is alkaline, and loaded with adhesive mucus, the injection of this organ with water, containing a small proportion of nitric acid, will

be of great use. I shall speak more particularly of this plan, in the chapter on chronic inflammation of the mucous membrane*.

In paralysis of the bladder, the constitutional treatment depends on the cause and the affection with which it is connected. In cases of disease or injury of the spine, of affection of the brain, and of general debility, the treatment required will of course vary.

Dr. Bally has employed strychnine internally in paralysis of the bladder, at the Hôpital de la Pitié, and has obtained from its use very decided benefit. Three patients have been cured in less than a month by this remedy, given in doses from one-tenth of a grain to two grains every four-and-twenty hours. M. Petrequin has likewise related several cases of the use and benefit of the same remedy in paralysis of the bladder, ensuing as a consequence of injuries done to the spine†.

If the complaint have not arisen from organic mischief, and the patient be not very old, recovery may take place. As the bladder recovers its tone, the patient fancies he can pass a little urine; and, on making the effort, he voids some, either drop by drop, or in a small stream. As recovery begins, the catheter should be less employed, until its use is entirely superseded. In other cases, particularly in elderly persons, the bladder never

* Vide Chap. v. on Chronic Inflammation of the Mucous Membrane, for the remedies best adapted to check the secretion of mucus.

† Gazette Médicale.

recovers its tone, and the use of the catheter is required as long as the patient lives. In fact, the patient frequently survives but a short time from the first occurrence of the paralysis.

Mr. Pix, aged 65, of a full habit, was suddenly seized with inability to pass urine, in consequence of which the catheter was introduced, and its introduction repeated twice, or oftener, in the day. The urine was of a very high colour, and contained blood. The power of the bladder never returned, and in ten days from the commencement of the attack the patient sank. On examining the body after death, the bladder was found very much thickened, and the mucous membrane of a dark red colour.

A state of bladder, nearly resembling paralysis, occurs in hysterical females; but it requires local treatment different from that which is adopted in other cases of retention. These cases, if left to themselves, usually recover; but, if we once begin to pass the catheter, its use will be for a long time required, and the complaint will be protracted. I distinctly recollect a case of this kind, in which the catheter was introduced twice a day, for some time, until at last an opinion was excited that the malady was either feigned or nervous, and that it would be desirable not to introduce the catheter. After this the young woman escaped from my notice; but I learned that the affection of the bladder soon subsided. As a general rule in these cases, the catheter ought not to be introduced.

CHAPTER IV.

ACUTE INFLAMMATION OF THE MUCOUS
MEMBRANE OF THE BLADDER.

THE symptoms of this disease are, frequent desire to micturate, accompanied by shooting throbbing pains in the region of the bladder, extending towards the urethra, and increased by pressure on the part, and by every motion of the body. There is a sense of heat or burning along the urethra, and a dull pain just above the pubes; the desire to make water is urgent; and the pain felt in passing a few drops is often compared by patients to the passing of melted lead. The pain subsides after the urine has ceased to flow, but returns as soon as a little urine collects in the bladder. The pain is not only felt along the urethra, and above the pubes, but it shoots into the perinaum and down the thighs. The urine is generally acid, and varies in appearance; being sometimes of a lemon colour; at other times a deep red; and on examination in a transparent vessel by the light, numerous shreds of lymph, or mucus, are seen floating in it. The urine is discharged in very small quantities, though its amount in twenty-four hours may equal the usual quantity. Sometimes there is sickness, with uneasiness in the

loins, indicating extension of mischief to the kidneys. The pulse is quick and small; the tongue, white; the patient is thirsty; the countenance, anxious; the skin dry, and often affected with some scaly eruption; and there is general uneasiness, augmented by the absence of rest and by the constant desire to make water.

If the disease be not arrested in the early stage, ulceration of the mucous membrane occurs; and it usually proceeds till the whole of that membrane is destroyed. It is often difficult to decide as to the existence of ulceration; but there is always reason to suspect it when disease of the bladder has been of long continuance, when the pain is extensive and increasing, and when pus is clearly detected in the urine. The ulcerative process is attended with constant pain and irritation, keeping up the desire to void the urine, which is never suffered to accumulate; while, at the same time, increased difficulty and pain generally attend the passing of it.

Ulceration may extend so deep into the substance of the bladder, as to cause perforation of its parietes; and cases are recorded of extravasation of urine thence taking place into the abdomen. In these cases, life is soon destroyed by the extension of peritoneal and cellular inflammation. But when the ulcerative process extends to the other tunics of the bladder, it usually happens that it is accompanied by effusion of lymph exterior to the ulcer, which thus unites the neighbouring parts, and pre-

vents the escape of the urine; and in this manner, a communication is sometimes formed between the fundus of the bladder and the ileum or the sigmoid flexure of the colon, or between the under surface of the bladder and the rectum; in the former of which cases, the fæces pass into the bladder, and through the urethra; while in the latter the urine passes into the rectum, and is voided with the fæces.

Mr. Wilson * says, "I have preserved the bladder and ileum of a person, which had adhered fifteen years before the death of the patient. Ulceration to a large extent had taken place in this connected part; and for the whole of the above-mentioned period, the fæces readily passed from the ileum into the bladder. The patient died when sixty-eight years of age. Being a female, the shortness of the urethra had allowed the substances which passed into the bladder a tolerably free escape, and no calculus formed."

Some years ago, I attended, with Mr. Garrod of Hackney, a lady, in whom some fæces passed through the bladder and urethra, and who is still alive.

In 1838, I was requested to see a gentleman, æt. sixty-two, in whom the fæces found their way into the bladder, and were passed by the urethra. He complained of frequent desire to make water, which was attended with smarting and scalding at the time of its passing. He had also great disten-

* Lectures on the Urinary Organs, p. 317.

sion about the lower part of the abdomen. Micturition was usually followed by severe darting pains at the end of the penis, and by the escape of flatus through the urethra. The urine, which was acid and albuminous, contained much feculent matter, with a good deal of mucus. It was clear, that in this case, there existed a communication between some portion of the intestinal canal and the bladder, through which the fæces passed; and, during their passage, the pain was intense. On examining the rectum with the finger, no stricture could be detected. The urethra admitted No. 6, with difficulty. The bowels were pretty regular; the motions were often solid; and their passage was not attended with pain. The treatment which was adopted, consisted in the use of suppositories and other sedatives, so as to keep the rectum and bladder in as quiet a state as possible.

In February 1840, when the fistulous opening seemed to be closed, and the general health was much improved, hæmoptysis occurred. During the treatment pursued for the relief of this attack, there were constant feculent discharges from the bladder attended with great exhaustion.

After this attack, the balance of the circulation was never restored; tympanites occurred, which distended the colon to an enormous magnitude; ascites followed the inflation of the colon, serous diarrhœa and anasarca supervened, and on the 15th April, 1841, the patient expired. For some

weeks prior to death, the escape of fæces through the bladder had altogether ceased*.

On dissecting back the integuments, and laying them open, the colon presented the appearance of a large tromboon, amazingly distended, and stretching the umbilical region, with its sigmoid flexure, equally large in the left iliac fossa. The space above its line was occupied by an enlarged liver, and that below by the small intestines. The omentum was shrivelled, and drawn across to the right iliac fossa; where it was adherent to the parietes above the internal abdominal ring. The peritoneum was universally opaque and injected. The sigmoid flexure of the colon, the ileum, and the cæcum, with its appendix, were each and all adherent, *en masse*, to the fundus of the bladder, and involved in a general thickening of the surrounding textures. The bladder, with the adherent intestines, was removed, and a particular dissection made of them, as follows:—

The colon, hypertrophied, singularly muscular, and in circumference about the size of a man's arm, was, together with a convolution of the ileum, and the appendix cæci, adherent to the fundus of the bladder. The natural course of its canal was impeded by a contraction or stricture, which commenced inferiorly in the rectum, about the forefinger's length from the anus (just at the base of the triangle formed by the vesiculæ seminales),

* Vide Guy's Hospital Reports, No. 13, p. 405, where a full account of the case, from which I have taken the following particulars, is given by Mr. Hingeston.

and extended upwards for about two inches, barely admitting the entrance of the little finger. A section of the gut in this part resembled scirrhus : and the glands were, with the surrounding tissues, thickened immediately above this stricture ; the coats of the bowel were studded with ulcerations and openings, leading into a channel which separated the bladder from the intestine. This channel was, in fact, a feculent abscess, situated beneath the reflected portion of the peritoneum, between the bladder and bowel. It was degenerate in structure, lined with a dark membrane, and filled with a muco-purulent excretion. It opened anteriorly into the fundus of the bladder ; above, into the colon ; below, into the rectum ; and posteriorly, through the colon into the ileum : so that there was a false passage, by which the natural course of the colon was diverted, and forced between the bladder and strictured part of the intestine down into the rectum below, and at the same place, by means of a fistulous opening into the bladder, in front. The orifice of this fistulous opening within the bladder was curtained by a fungous growth or thickening which overhung it like a valve. Thus, exactly at this point of the feculent abscess, there was this strange deformation : the colon, the rectum, and the ileum ; each, conjointly with the fæcal abscess, possessed one common entrance into the bladder itself.

Within the bladder, the rugæ of its mucous membrane were vascular, and its muscular coat was considerably hypertrophied.

In a case which I visited with Mr. Rance of the City Road, and which terminated fatally, there existed a communication between the fundus of the bladder and the colon, just above a stricture, in the sigmoid flexure.

I am indebted to Mr. Rance for the following account of it :—

“ About the latter end of June 1831, I was called to visit Mr. Henry Cooper. He complained of a deep-seated dull pain in the lower part of the abdomen, extending from the pubes to the sacro-iliac symphysis of the left side ; he said he had been affected with pain in the bowels for nearly twelve months ; and he also complained of considerable uneasiness in the urethra and of a burning sensation towards the extremity of the penis. The urine was high-coloured. On pressing the hypogastric region with firmness, he suffered considerable uneasiness ; his tongue was dry, a little furred, and of a brownish hue ; his pulse was quick, about 110, and rather firm. I bled him to the amount of about eight ounces ; ordered a dozen leeches to the perinæum, and a blister to the lower part of the abdomen ; and administered a purgative. On the following day, the pulse was softer, and the urine high-coloured, with a very considerable deposit of a purulent kind, and of very fetid smell. I ordered *Liquor Potassæ* and extract of *Hyoscyamus*. On the following day, I found that the urine contained a considerable quantity of feculent matter, which led me to conclude that there must be an ulceration

of the intestines. Flatus was also passed through the urethra; stools, voided per anum, were always loose; and the patient said he had not passed a solid stool for a very considerable time. On examination per rectum, the finger could not reach any ulceration or stricture; and it appeared that no urine had ever passed per rectum. The pain and uneasiness increased; and in the treatment I confined myself to sedatives, and administered various forms of opium. The strength of the patient gradually decreased; and he sank in the latter end of August.—I obtained permission to inspect the body, and found that a stricture existed in the sigmoid flexure of the colon. Above the stricture, there existed slight adhesion with the fundus of the bladder, towards the left side. There was an opening through the stricture, about the size of a goose-quill, through which some fæces passed into the rectum; but from the narrowness of this passage, it was impossible that any solid fæces could pass. A portion of the intestine for about two inches above the stricture, as well as part of the fundus of the bladder, appeared gangrenous, and in a state approaching to sloughing; the coats of the bladder were thickened; the bladder itself was not bigger than a large orange; and from being much thickened, it appeared incapable of further distension.”

The foregoing case is a good illustration of the effort which the system, at times, makes to evacuate what is extraneous by the most direct passage when

there exists an obstacle to its expulsion in the natural way; and is strictly analogous, pathologically considered, to what we sometimes see occurring when an abscess forms in the liver. There we find adhesion first taking place between the liver and duodenum or colon; and through an ulcerative process that follows, the matter of the abscess is evacuated by the gut.

The more usual course of this disease is, that ulceration gradually extends to the whole of the mucous membrane, which is destroyed; and then the muscular structure is shown more clearly than any dissection can exhibit it. In the progress of the ulceration, disease commonly manifests itself in one of the kidneys; and, as far my observation goes, usually in the left one*. This is indicated by pain

* M. Rayer, *Traité des Maladies des Reins*, tome iii. p. 17, cites the following authors who thought that the left kidney is more frequently affected than the right:—

BOERHAAVE, *Prælectiones ad Inst.* § 352.

CHARLES LEPOIS (*Obser. de Morbis a seros. colluvie*, t. iv., c. 2, obs. c.) says, that of a hundred subjects attacked with calculus nephritis, upwards of eighty suffered in the left kidney.

HOFFMANN (F.) *Med. Ration.* t. iv. p. 1, sect. 3, cap. 8, § 7, de febre nephriticâ.

P. FRANK, *Medicina Præx.*

MORGAGNI (*de Sed. et Causis Morb.* Epist. xi. art. 13).

KIESEWETTER de Lithiasi sinistro quam dextro Reni magis infesta.
—Halle 1776.

EARLE, *Med. Chirurg. Transactions*, vol. xi. p. 216, 217, and 227.

RICHTER, *Spéciale Thérapie*, t. iv. p. 4833.

HALLER, *Elementa Physiologiæ*, t. vii. p. 368.

VOIGTEL, *Pathol. Anat. B.* iii. s. 188, 207.

COITER (*Extern. et Intern. Princip.*, *Observationesque variæ*, observ. xxxiii. §. 3), on the contrary, thought the right more frequently affected than the left.

in the loins on pressure (for the pain is never very severe), by shiverings, sickness, and the albuminous state of the urine. At this stage, large quantities of pus are voided with the urine, and the latter is tinged with blood.

As to morbid appearances, it is known that, in a natural state, the inner membrane of the bladder is very seldom tinged with blood on its inner surface; but, when inflamed, it appears covered with a multitude of delicate blood-vessels, which are sometimes intermingled with little spots of extravasated blood.

The inflammation of the inner membrane of the bladder, extends itself either over the whole bladder, or is limited to some particular part of it: most commonly, that part which adjoins the neck of the bladder is found in a state of inflammation. The inner membrane is sometimes covered with coagulable lymph; this substance having been found projecting into the cavity of the bladder; and portions of it having been occasionally separated during life.

In Dr. Baillie's plate of ulceration of the mucous surface, the ulceration commenced from the fundus, and proceeded towards the neck. In a specimen which I possess, and in which part only of the membrane is destroyed, it commenced at the neck.

If the inflammation reach a high degree, the muscular coat is also attacked, presenting here and there gangrenous spots, or even being completely destroyed by it. But, as the muscular coat is con-

nected but loosely to the inner membrane of the bladder, the inflammation does not easily pass from one to the other. One of the kidneys is usually found in a state of ulceration containing pus, the ureter inflamed in its whole course, and ulcerated at its vesical extremity. In most of the cases which I have dissected, the whole of the membrane has been removed by ulceration *. Sometimes, however, round ulcerated spots, of the size of a sixpence, are found in different parts with elevated edges and a red surface, the muscular structure not being seen, and the remaining membrane being very vascular. The ulcers, when small, are not unlike primary syphilitic sores, by their excavated surfaces and raised margins †.

This affection may be confounded with inflammation of the muscular structure; but in the latter case, there is not the power of passing urine, and the desire to void it is less frequent, as it is not experienced until a good deal of urine is accumulated in the bladder, and then comes on in violent paroxysms. Neither is there the burning sensation along the urethra which is felt when the mucous membrane is affected.

This disease is likely also to be mistaken for stone. The uneasiness in the bladder, the frequent desire to make water, and the passage of blood with the urine, are symptoms of stone as well as

* Vide Plate I. at the end of the volume.

† Cyclopædia of Practical Medicine, vol. I., Article *Cystitis*, by Dr. Cumin.

of this disease. But in stone the pain is principally experienced after the bladder has been emptied; whereas, in acute inflammation of the mucous membrane of the bladder, the pain is most intense when the bladder contains urine, and it subsides when that viscus is empty: in stone, also, larger quantities of blood are passed than in this disease, and the urethra is seldom so irritable.

At the commencement, blood should be taken by cupping or the application of leeches to the hypogastric region, and this should be repeated so long as the severity of the pain continues, and the strength of the patient will allow. Commonly, however, the loss of much blood cannot be borne. At the early stage, the most valuable remedy is morphia, or opium, (I prefer the former,) given in sufficient doses to allay the pain about the bladder and along the urethra, as well as the frequent desire to pass urine. These are the most distressing of the symptoms; and if unmitigated, they soon wear out the strength of the patient: but if even a few hours' intermission be obtained in the day, some chance may exist of recovery.

In addition to the internal use of opium, or morphia, anodyne injections, or suppositories, should be exhibited at bed-time; and great relief will be experienced from their use. Some practitioners recommend the injection of oil and opium, and other remedies, into the bladder, by means of a gum-elastic catheter. In one of my patients, this plan had been tried at the suggestion of an

eminent physician, prior to the patient being placed under my care : but no benefit was derived from the treatment. In fact, the pain and irritation caused by the introduction of any instrument along the urethra, are so severe, as to deter me from employing this method ; and unless there be retention of urine, which is very rare in this form of disease, the use of the catheter, sounds, and bougies, should be particularly avoided.

It is advantageous to employ counter-irritation above the pubes ; and the hip-bath at night will be found very serviceable.

In the treatment of these cases, however, we find that no remedy, opium or morphia perhaps excepted, long retains any influence over the disease. The practitioner must be provided with a variety of agents, so as to be ready to substitute one for another when it loses its effect. Infusion of diosma in the proportion of an ounce to a pint of water, small doses of copaiba and essential oil of cubebs, infusion of hops and the alkalies, will all, in their turn, be found useful.

Excepting at its commencement, mercury is not of use in this form of inflammation.

To the diet of the patient, the greatest attention should be paid. Beer, wine, spirits, and acid drinks, should be interdicted ; the diet should be light, consisting of bland, farinaceous food ; and the drink should be water, toast-and-water, and linseed-tea ; but not to such extent as to increase, in any very considerable degree, the secretion of

urine. The patient should also be kept as quiet as possible, and in a rather warm temperature.

The prognosis of these cases is very unfavourable, if the ulcerative stage once set in. If the pain be not subdued early, little hope can be indulged of a successful termination : by judicious management, life may be prolonged for some time, but the patients are seldom cured. Having witnessed several cases of this kind, most of which terminated fatally, I indeed fear that, if ulceration to any great extent exist, the disease is irremediable ; all we can then do is, by opium and other narcotics, administered internally, to endeavour to lessen the irritation and pain.

If a female (and females are more subject to this complaint than males) happen, whilst labouring under the disease, to become pregnant, this state greatly mitigates the symptoms, and for a time averts the fatal termination. In 1827, I examined the body of a French woman, who, immediately after her delivery, was attacked with all the symptoms mentioned above, and died within a week from the attack. On examination, the inner membrane of the bladder was found to be completely destroyed. I could not obtain any accurate account of the case ; but I learnt that the patient, during the few days she was in the hospital prior to delivery, did not complain of the affection of the bladder. One case, however, I watched from the commencement of the disease (which occurred a month after marriage) till the

death of the patient, which took place a month after delivery. During the latter half of her pregnancy, the symptoms were much milder than before; but, soon after the child was born, they returned with their accustomed severity, and destroyed the patient.

CASE.

DESTRUCTION OF THE MUCOUS COAT OF THE BLADDER.

On the 17th of May, 1834, I was requested to visit Mrs. M., æt. thirty-six, who was supposed to be labouring under symptoms of stone. She had frequent desire to make water, attended by darting shooting pains in the region of the bladder, which were much increased by walking, and exercise of every kind. The urine itself was acid, and contained some shreds of lymph or mucus. No blood or gravel had ever been passed. I sounded the patient, and the instant the instrument was introduced into the urethra, the pain experienced was most intense, and continued during the whole of the examination. No stone could be felt. The pulse was small and quick, the skin dry and rough, the tongue white, the countenance anxious, and indicative of much suffering. From the first, I expressed a very unfavourable opinion of the case, believing, as I then stated, that there was ulceration of the bladder. She had been in this state for two months, and various remedies had been

tried. I suggested the use of *pareira brava*, first in the form of infusion, then in that of decoction. For the first six weeks, leeches were occasionally applied to the hypogastric region, tartar emetic ointment was rubbed in, and at night, a thin starch injection, with twenty minims of Battley's sedative solution, was given. After this time, Mrs. M. tried only the decoction of *pareira brava*, till about two months prior to her decease, when perceiving more mucus in the urine than usual, and occasionally blood, I added a very small quantity of balsam of copaiva to the mixture (two drachms to eight ounces of the decoction, with some mucilage). This brought on sickness and deranged the stomach so much that thenceforward she was obliged to desist from the decoction. She now had sickness and nausea; pus was voided with the urine; there was complete loss of strength, emaciation of the body, and hectic flushes; and, on the 24th of November, death put an end to her sufferings. It should be observed that, for a few days prior to her death, no pus had been voided with the urine, and the pain and frequent desire to make water, for the only time during her long illness, had almost left her.

Within forty-eight hours after death, the body was examined by Mr. Merriman, of Kensington, and myself. The bladder was not thickened nor contracted, but so completely divested of its mucous membrane, that not a single vestige of that coat could be seen. No dissection could exhibit the

arrangement of the muscular structure so well as it was seen in this case. One spot, of the size of a shilling, towards the fundus was black, and almost gangrenous. The ulceration had not extended to the urethra; but its lining membrane was highly inflamed. The right kidney was in its natural state; but there was ulceration of the left kidney, and its interior was filled with pus. The renal extremity of the left ureter was blocked up by a detached portion of the substance of the kidney.

CASE OF ULCERATION OF THE BLADDER, URETER, AND KIDNEY.

Deborah Mulloday, aged forty-six, was admitted under my care at the General Dispensary, for an affection of the bladder. She complained of great uneasiness, sometimes of pain in the lower part of the belly, and of frequent desire to void urine. After the bladder was emptied, the pain and uneasiness usually subsided. These symptoms were at first relieved by the use of the decoction of *pareira brava*. The pain was at times very acute, the desire to make water became more frequent; the urine contained a good deal of pus; and, on two or three occasions, it was tinged with blood. The pulse was small and quick; the countenance pale and sallow; and there was emaciation of the body, with occasional shiverings and cramps. She had no pain in the loins; and there was no sickness until about ten days prior to her death, when

it was very distressing, and of some days' continuance. On Friday, July 26, she was seized with paralysis; and she expired on the following Tuesday.

Twenty-four hours after death, the body was examined. The mucous membrane of the bladder was ulcerated in several spots, but was not so extensively destroyed as in the preceding case. The bladder, which was thickened and contracted, contained a good deal of pus. The vesical extremity of the left ureter was ulcerated; the substance of the left kidney in some parts was completely destroyed by ulceration, and its pelvis full of pus. The right kidney was in a state of atrophy; and its interior contained a deposition of chalky matter. The urethra was inflamed, but not ulcerated.

CASE OF ULCERATION OF THE BLADDER.

George Scandreth, æt. fifty-six, tailor, residing at 81, Great Leonard-street, Shoreditch, applied to me, Nov. 13, 1835, on account of an affection of the bladder. He complained of frequent desire to pass urine, of great pain at the time of passing it, as well as afterwards, of a scalding sensation in the urethra, and of pain above the pubes and across the loins. The urine was high-coloured, and contained numerous fine shreds of lymph; it was also acid, scanty, and albuminous.—I ordered some soothing remedies which, for a time, diminished the pain in making water, but had no other effect on the disease. The symptoms of disease of the

bladder became gradually worse; and he died, worn out, January 28, 1836.

On examination after death, I found the mucous membrane of the bladder almost completely destroyed, minute filaments hanging loosely from its inner surface; the bladder contracted in size, and a little thickened; the lining membrane of the urethra highly inflamed and ulcerated about the membranous portion; the prostate not enlarged; the left kidney in a state of ulceration, and containing pus. I have the preparation in my possession.

CASE OF ULCERATION OF THE BLADDER.

William David Sadler, aged seventeen, of a delicate constitution, and light complexion, applied at the General Dispensary, Dec. 3, 1832, for an affection of the bladder. He said, that about seven months before this period, he first felt pain in making water, which lasted for some minutes, and then went away. Since that time this symptom had never left him. All of a sudden he occasionally felt a darting pain near the neck of the bladder, accompanied with an irresistible desire to make water. The pain then subsided; he made water, and felt easier. These attacks varied as to the frequency of occurrence—sometimes every hour or oftener, at other times at longer intervals. The urine was turbid, voided in small quantities, and extremely acid. The appetite was good; the general health, not much deranged; the pulse,

quick; the tongue, white and dry. A sound was introduced two or three times, but no stone could be felt: this operation always gave him great pain.

Alkalies and hyoscyamus; small doses of cubebs with carbonate of potash, the decoction of pareira brava alone, and also in combination with small doses of copaiba and mucilage, with hyoscyamus, were tried; but he benefited by nothing which he took.

This patient escaped from my notice; but he died a short time afterwards, and I was informed by the medical man who examined the body, that there was ulceration of the bladder, together with disease of the left kidney.

CASE OF ULCERATION OF THE BLADDER.

Charlotte Mason, æt. fifty-six, a married woman without family, and subject to pains in the limbs, was seized, in the month of March, 1837, with a frequent desire to void urine, which was always attended with great pain, and a burning heat in the urethra; the pain continued for some length of time after the urine was passed, so that she could scarcely stand or sit down: had great pain in her back, and the lower part of the abdomen, headache, and, at times, pains in the left hip and leg, attended with great weakness and trembling, and general debility. During the night she was generally obliged to get up to micturate four or five times at least: the urine was alkaline, of a light straw colour, and latterly contained a good deal of

pus. The disease resisted all the remedies which I could devise. Morphium alone gave her relief. She gradually lost flesh and strength, and died on the 30th of December last.

I examined the body on the following day, and found the whole of the mucous membrane completely destroyed by ulceration. The left kidney was also in a state of ulceration, and the lining membrane of the left ureter, to the extent of two or three inches, close to its vesical extremity, thickened and lined with coagulable lymph.

Dr. Prout, in alluding to the cases I have brought forward in illustration of this subject, considers them nearly allied to irritable bladder dependent on organic mischief in the kidney. "The urine in these cases," says Dr. P.* "is generally acid, of a pale greenish whey-like colour; opalescent, from the presence of minute epithelium or mucus; of low specific gravity; (that is, generally below 1.020;) often serous, but rarely bloody. Sometimes, on being heated, it deposits the phosphates; but the lithate of ammonia is seldom so abundant as to be spontaneously separated on the cooling of the urine; and when this circumstance does take place, the colour of the sediment, instead of being yellow or red, is usually of a greyish ash tint. After standing for some time, the urine becomes clearer, but seldom acquires perfect transparency,

* Op. cit., p. 393.

even by filtering; and the peculiar sediment in general is very easily remixed on shaking.

“In conjunction with these appearances of the urine, the patient usually complains of the following symptoms: there is a frequent and urgent desire to pass water, the period varying from one to three hours, and the quantity from one to two or three ounces, both by night and by day. At the moment of passing water, and for some time afterwards, there is an uneasiness, sometimes amounting to severe pain, felt along the whole of the urethra, but particularly just behind the scrotum; and of this uneasiness or pain, a sense of burning or scalding is one of the elements. There is no mechanical impediment to passing the water; and in the earlier stages, after a short time, the whole uneasiness subsides, and the patient remains quite well till the period arrives when he is called upon, as before, to empty the bladder. As the disease advances, all these symptoms become augmented. The unnatural properties of the urine, and of the mucous deposit, increase; the symptoms, and particularly the calls to pass the urine, are more urgent and frequent; the general health and strength, which from the commencement had been disordered and enfeebled, now daily decline, and the patient becomes emaciated, weak, and irritable, and more than ever susceptible of the influence of atmospheric changes. During the whole of this period there is but little uneasiness felt in the region of the kidneys, and what little

there may be, is usually referred to weakness. On minute inquiry, patients will sometimes admit the existence of a dull aching sensation in the loins, and occasional darting pains down the course of the ureter, and even to the testicles, &c.; but these are so trifling compared with the bladder sensations, that they are seldom complained of, unless particularly inquired after. The termination of the complaint is various; most frequently perhaps as follows:

“The pulse gradually becomes more weak and feeble, and the stomach, from being weak and disordered, often rejects what is taken, so that the patient is very apt to be sick after eating. At the same time the urine, though not improved in quality, is diminished in quantity, and the calls to pass it are in consequence less frequent. The patient complains of nothing, but he daily becomes more indifferent and drowsy; as the sickness increases, the urine is still further diminished in quantity; at length everything is rejected, the secretion of urine ceases altogether, and the patient expires, generally in a comatose state. Occasionally the termination is more sudden and unexpected; and in such instances inflammatory symptoms have been generally superinduced from exposure to cold or some other exciting cause. Now and then the patient becomes phthisical—in short, the fatal termination, though always certain, may be various, and depend upon the peculiarities of the patient’s constitution, and accidental circumstances.

“Several of the cases described by Mr. Coulson, under the denomination of Acute Inflammation of the Mucous Membrane of the Bladder, seem to me to be nearly allied to this form of disease. I have reason to believe that the present disease often exists for years in a chronic form, and confined chiefly to the kidney: that when the degenerating process reaches and attacks the bladder, it sometimes assumes, either spontaneously or from accidental circumstances a more acute form, and terminates fatally like those described by Mr. C., with complete destruction of the mucous membrane of the bladder, &c.”

There is one mark of distinction between the affection which I have described and irritable bladder dependent on organic affection of the kidney so striking, as to have enabled me hitherto to determine with tolerable accuracy, the existence of the diseases:—I mean the intense pain which attends inflammation and ulceration of the mucous membrane of the bladder, and soon exhausts the strength of the patient. Now in irritable bladder dependent on organic affection of the kidney, there is sometimes but not always pain in passing the urine; the frequency of making water is the most distressing symptom, and even when pain exists, it is never so severe as to wear the patient out, but may be, and frequently is, endured for years.

The intensity of the pain and the rapid exhaustion of the vital powers, mark the distinction between the two classes of cases.

CHAPTER V.

CHRONIC INFLAMMATION OF THE MUCOUS MEMBRANE OF THE BLADDER.

MEN are more subject to this complaint than women, and elderly persons than young ones. In some countries the disease appears to be uncommon, as Hoffmann calls it *morbus rarissimus*. In others, it occurs more frequently, and something like it has been known to assume an epidemic character.

An attack of the disease is sometimes preceded by a sense of weakness, shiverings, and other febrile symptoms. At other times, it manifests itself of a sudden by pain.

The discharge of mucus is the great characteristic of the disease; and hence the term *vesical catarrh*. This is accompanied by a sensation of heat in the bladder, extending along the urethra, and of weight in the perinæum, shooting pains towards the anus, and frequent desire to void urine, though not in so great a degree as in the acute inflammation.

Sometimes the symptoms are very mild, and cause but little inconvenience; at other times, the disease assumes a serious character, and even proves fatal, especially in old and weak persons. Then,

the expulsion of the urine, but more particularly that of the last few ounces, is more or less painful, according to the violence of the contractions of the bladder and abdominal muscles to expel the foreign matters united with it. The heat in the bladder and urethra are converted into scalding; the desire to make water becomes more frequent, and is attended with violent straining efforts to void it; and retention, usually caused by clots of mucus blocking up the passage, often takes place. On the urine being drawn off, the symptoms are relieved for a time; but they return on the filling of the bladder.

The patient is very restless and uneasy; there is great thirst; the bowels are irregular, generally very costive or relaxed; there exists pain at the extremity of the penis, round the anus, and in the region of the loins; there are great prostration of strength and wasting of flesh; and the patient at last dies completely exhausted.

The quantity of mucus secreted varies: sometimes it is small; at other times it is considerable; and cases are recorded, in which several pounds were passed during the twenty-four hours.

Small quantities of the mucus thus coming away, render the urine muddy, pale, and flaky, and afterwards settle to the bottom of the vessel.

The mucus,* however, is sometimes like panada, and, being shaken, colours the urine without flakes: at other times, it is stringy, flaky, and of

* Vide Sæmmering über die Krankheiten der Harnblase, &c.

a lumpy consistence. It has been seen so glutinous, as, on pouring it out of one vessel into another, to be drawn out above a foot in length, without rending. Sometimes, it is transparent, white, yellow, green, with streaks of blue, often without smell: sometimes, on the contrary, it is dreadfully fetid. Blood and pus are often passed with the mucus in this disease.

When the properties of the mucus are but little changed, it diffuses itself throughout the urine for a time, and renders it turbid and of whitish colour, but it afterwards subsides to the bottom, and leaves the urine to assume its usual hue. Commonly it is thick, viscid, and ropy, and sinks to the bottom of the vessel at once: in this case, the urine is of a dark brown colour, and is either neutral or alkaline. The urine, however, is usually acid at the commencement, and continues so until the quantity of mucus secreted is great: in this case especially, if the patients are very feeble, the urine is alkaline or neutral.

If the mucus come away in large quantities, and be at the same time glutinous, it requires an effort to discharge it, and it often occasions retention. After voiding it, the burning sensation in the region of the bladder ceases, but that gradually returns as the mucus again collects.

If the secretion of mucus be copious, the patient becomes hectic, and at last sinks from exhaustion.

In slight cases, the mucous membrane is inflamed, and, as if blood had been effused beneath

the surface, it presents here and there red spots; while some are seen of a darker colour, almost amounting to black. Sometimes the membrane is abraded, particularly around the darkest patches; and, in rare cases, it has been entirely removed so as to leave the muscular fibres exposed.

In the severe form of the disease, all the muscular fibres of the bladder are much enlarged, thickened, and occasionally covered here and there with calcareous deposits. I have, in my possession, a bladder taken from a man who had long suffered from vesical catarrh, presenting this appearance.* The fundus of the bladder is usually most diseased, but the whole of it is thickened, contracted, and harder than natural, and its mucous membrane is purplish, injected, and presents many folds or columns of greater or less thickness, according to the period of the disease and their situation. They are always longest and largest at the fundus. This thickening of the walls, as well as the columns, is exclusively owing to the hypertrophy of the muscular coat, some fibres of which, from increased action, have become more developed; and hence it is that the French call the disease, "*la vessie à colonnes*," from the resemblance these columns bear to the *columnæ carneæ cordis*.

The most prominent portions of these folds are usually of a blue or purplish red colour; while between them, the membrane is pale, swollen, soft, and offering little resistance; occasionally small

* Represented in Plate II.

ulcerations are found. But what is very remarkable, between the folds, pouches or sacs generally co-exist with dilated ureters, both being produced by the same physical cause, (forced distension,) in consequence of prolonged difficulty in expelling the urine; the formation of the former may be explained in the following manner:—The contraction of the abdominal muscles, as well as of the bladder itself, when full of urine, forces portions of the lining membrane of this organ between the muscular fibres, and thus sacs or pouches are formed, and these pouches being lined by a diseased mucous membrane, secreting an alkaline mucus, sometimes become the receptacle of mortar-like matter, and, finally, of calculi, consisting generally of phosphate of lime.

The kidneys, too, generally suffer: either they are simply inflamed, with the infundibula and pelves much enlarged; or they are in a state of ulceration. The ureters are likewise inflamed.

The ureter and pelvis of each kidney are generally dilated, and this dilation is greatest where there has been a long and continued difficulty in expelling the urine from the bladder.

It has been said that when vesical mucus is passed in small quantity, the disorder may be mistaken for an involuntary evacuation of semen, which accompanies in some persons the escape of the urine and fæces. These two fluids are analogous by their viscid and alkaline properties, and the substances which compose them; but semen

differs essentially from mucus by its colour, by the property which it has of liquifying on cooling, by its insolubility in water when thick, and its solubility on the contrary when it is liquid, and especially by the radiated crystals which it produces after slight evaporation.

The urine in this disorder may be also distinguished from chylous urine, because the latter, immediately it is passed, presents a whitish appearance, and the sediment, on shaking, mixes with the urine; on the contrary, the urine in vesical catarrh is at first turbid; on standing, the sediment becomes viscid, ropy and flocculent, or united into one clot.

The exciting causes of catarrh of the bladder, are stricture, stone, enlargement of the prostate, exposure to cold, indulgence in ardent spirits, diuretic and irritating remedies, such as cantharides, violent exercise on horseback, venereal excesses; and it exists in connection with hæmorrhoids, and other diseases of the rectum. In injuries and diseases of the spine, this state of the bladder often occurs.

When this disease co-exists with stricture of the urethra, or is produced by it, it is extremely difficult of treatment. The pain and irritation along the urethra are often so great as to render the use of catheters and bougies impracticable; and, unless the state of the urethra improve, no material benefit can be expected from internal remedies. Under these circumstances, free use

must at first be made of sedatives ; and, when the pain and irritation of the urethra have subsided, this canal must be dilated with bougies or the gum-elastic catheter. If the stricture be of long standing and very narrow, I commence with armed bougies, introducing them once in three or four days, and in very few cases have I failed, by this means, in dilating the urethra.

There are some habits apparently more predisposed to this affection than others : such are those of irritable scrofulous temperament, with fair skin, and tendency to cutaneous affections, more especially if accustomed to live freely, or given to venereal excesses, or have suffered from venereal affections, or gout. In such individuals, exposure to cold seems one of the most frequent of the exciting causes of this affection, and those who actually labour under it, generally suffer much more severely in cold weather. Gouty persons are very subject to this affection.

Cases of milder character have been observed to terminate in a short time, or to assume an intermittent form, especially when associated with hæmorrhoids, or certain petechial affections ; but the duration of this complaint is uncertain. Old persons mostly retain it as long as they live.

The catheter, even if there be no retention, must occasionally be employed ; but in severe cases, retention generally exists, and the water should be drawn off twice or oftener in twenty-four hours.

Nitric-acid injections are of great use in cases where the effects of the disease are local; the general health not being much impaired, and the patient feeling comparatively well when the scalding and pain after passing urine have subsided. In cases, also, where the internal administration of acids appears to have no effect on the secretion of mucus, the injection of acid is of great service. The following case strikingly illustrates the beneficial effects of acid-injection.

Mr. F., æt. sixty-seven, slightly rheumatic, consulted me April 7, 1838, on account of an affection of the bladder. He complained of frequent desire to make water, with severe pain and scalding along the urethra, just before and during its passage, and of uneasiness or sense of weight just above the pubes. He had occasional retention, and was frequently compelled to pass a catheter to draw off the urine. The disease was brought on by retaining the urine on one occasion, after the desire to void it had come on. There was no enlargement of the prostate, nor any stricture. The urine was alkaline, and contained a considerable quantity of mucus, which was of a dirty white colour, and sank to the bottom of the vessel; it was stringy, and on being shaken with the urine did not mix: it was free from blood. The urine, on being passed, had a slight ammoniacal smell; but this became very strong on standing twenty-four hours. Its specific gravity was 1.015. His general health was not impaired; and he felt

pretty well when the burning pain, which attended the passing of urine, had subsided, until a fresh desire came on.—I tried the decoction of pareira brava, with the dilute nitric acid and sedatives, without any relief whatever. May 8th.—The quantity of mucus with the phosphatic deposits increasing, I recommended the injection of the bladder, first throwing in, by means of a gum-elastic syringe and catheter, four ounces of decoction of poppy; and, on withdrawing this, four ounces of water, containing two minims of strong nitric acid. I kept this in for two or three minutes and withdrew it. He took half a grain of morphia immediately after the injection. The symptoms were a little, but not materially, improved by the injection. May 10th.—I injected ten ounces of distilled water, with one minim of the strong nitric acid to the ounce of water (five ounces at each injection), and caused each quantity to be retained for two or three minutes, until he complained of slight pain or uneasiness. May 12th.—The symptoms and condition of the urine were slightly improved. I injected ten ounces of distilled water, with two minims of the strong nitric acid to each ounce of water, in the same manner as before. This injection was followed by considerable pain, which continued during several hours; but, on the following day, the urine was much changed in appearance, contained little or no mucus, and had lost its dark brown colour and became of a light straw colour. The irritability

of the bladder was considerably lessened.—I injected the bladder twice after this, but with a smaller proportion of acid; the urine which had been alkaline became acid; the patient lost all his bad symptoms; and he has continued well up to the present time.

“In aggravated cases of the disease,” says Sir B. Brodie, “where the symptoms are at their greatest height, the mildest injections, even those of tepid water, will do harm rather than good. They are especially to be avoided when the mucus deposited by the urine is highly tinged with blood. When, however, the symptoms have in some degree abated, the injection of tepid water, or decoction of poppies is, in many instances, productive of excellent effects. An elastic gum-catheter may be introduced into the bladder; and the injection may be made by means of a small elastic-gum syringe. The liquid should be allowed to remain in the bladder about thirty or forty seconds; and not more than an ounce and a half or two ounces should be injected each time. If the bladder be distended, so as to occasion any considerable degree of pain, the effect is always injurious, instead of being beneficial. This operation may be repeated, according to circumstances, once or twice in twenty-four hours. When there is a further abatement of the symptoms, the disease having assumed a still more chronic form, and the mucus being free, except on extraordinary occasions, from all admixture of blood, we may venture

to add to the injection a very small quantity of nitric acid. At first, the proportion ought not to be more than that of one minim of the concentrated, or ten minims of the diluted, nitric acid, to two ounces of distilled water; but afterwards this proportion may be doubled."

I use the same apparatus for acid injections as for injecting the bladder in lithotrity, as the minute quantity of the acid is not likely to act on the nickel-silver of which these instruments are composed.

Professor Lallemand* has successfully practised cauterization of the mucous membrane of the bladder in chronic catarrh, with solid nitrate of silver. The following is his mode of employing this remedy:—He uses a large catheter (of pure silver, as the caustic acts upon it if there is any alloy) open at both ends, having two sorts of stilet, according to the part intended to be cauterized; at the extremity of each stilet is a small excavation, containing the caustic, which is first pulverised, and then placed in the excavation over a spirit-lamp, which fuses and moulds it to the cavity.

When the instrument is prepared, introduce into the bladder an ordinary catheter, in order to empty it completely. This precaution is strictly necessary, for the urine would dissolve the caustic, and prevent

* I am indebted for this information to an able paper on Chronic Cystitis, by Dr. O'Bryen, in the *Dublin Journal of Medical Science*, September, 1838.

its directly affecting the mucous membrane. When this has been withdrawn, the instrument bearing the caustic is to be introduced (closed), and the moment it has entered the bladder, you are to push the stilet, and rapidly turn the *porte caustique* from side to side two or three times, and then pull the stilet into the instrument, and withdraw it; our object should be to touch the surface in as many points as possible. While the instrument is within the bladder, the latter contracts and grasps it, while the kidneys secrete a small quantity of urine, as the lachrymal gland secretes tears when the conjunctiva is cauterized; but this small quantity of liquid, far from being hurtful, is on the contrary favourable, as it acts as a vehicle to the portion it does not decompose, and conveys it equally over the surface of the membrane. Patients feel, at that moment, a sharp pain at the neck of the bladder, and in the rectum, described by them as if they were pinched, but much more supportable than the continued dull pain of chronic catarrh; there is now an irresistible desire to pass water, and as the bladder is nearly empty very little is voided, and this causes a burning along the urethra, often accompanied by some drops of blood. This desire is renewed every moment, causing violent but useless efforts. These gradually decrease, and on the second and third day, there is no longer any pain on making water, and a few small grey eschars, like burned paper, come away with the urine. This occurs in a large number of patients, but in

some more susceptible, the process does not proceed so simply, particularly if you have used the porte caustique too long. In this case retention of urine follows, which lasts from three to thirty-six hours; even here we must not be in too great a hurry to use the catheter, as a warm bath, a few narcotic lavements, emollient drinks, some tartrate of soda, with infus. sennæ, and sometimes a few leeches, will cause the spasms to yield; if not, some belladonna to the meatus may be tried, always taking care to use antiphlogistics with moderation in the beginning, as inflammation is necessary to the cure. In a majority of cases one cauterization is sufficient to effect a cure; when it happens otherwise, a second and even a third application may be necessary, but Monsieur L. states that he never saw a case requiring a fourth.

Dr. Devergie * has recorded eight cases of chronic catarrh, some of long standing, which were cured by injecting balsam of copaiba into the bladder. Some of these cases had succeeded to acute cystitis; in others the disease had gradually manifested itself, and maintained throughout its chronic character. A moderate quantity of an emollient fluid must first be injected, to ascertain the capacity of the bladder, but not in sufficient quantity to irritate it. General means must be resorted to, to calm the inflammation and local pain, the general erethism, &c. Narcotics must next be added to the emollient injections; and these may be repeated three or four times a-day.

*Gazette Médicale de Paris, and British and Foreign Medical Review.

When the irritation of the bladder and neighbouring parts is allayed, the copaiba should be injected. A dose of uniform strength is not suited to every case. A drachm of balsam of copaiba to an ounce of barley-water is strong enough to commence with ; the quantity of balsam may be increased according to its effects. The combination of narcotics with copaiba renders the latter less exciting. The balsamic injections may be allowed to remain in the bladder for a period of from ten to twenty minutes. The quantity of copaiba is to be gradually augmented ; and it should not be injected more frequently than once daily, nor intermitted more than two days. The injection is to be continued until the muco-purulent secretion has quite ceased. It is necessary to guard against the occurrence of inflammation of the mucous membrane of the alimentary canal, and, under such a circumstance, to suspend the use of the balsamic injections.

The tenacious mucus produced in this state of the bladder deposits phosphate of lime ; and when phosphate of lime from this source coexists, as it often does, with the triple phosphate in the urine, a compound salt is formed. In such cases, a weak solution of nitric acid (beginning with a drop, and gradually increasing it to two, of concentrated nitric acid to two ounces of distilled water), if injected into the bladder, acts as a salutary astringent.

In these cases Chopart recommended injection of the bladder ; and he mentions the case of a man

sixty-five years of age, almost worn out by excessive secretion of mucus, who was cured by this means.

The medicines found most serviceable where there is much secretion of mucus, are the decoction of uva ursi, with the muriated tincture of iron, and small doses of powdered galls and nitre. If there be much pain and irritability of the bladder, the decoction of pareira brava is an excellent medicine; and it may be combined with nitric or nitro-muriatic acid, or dilute phosphoric acid, to lessen the secretion of mucus. If there be much pain and restlessness, morphia or opium ought on no account to be omitted. Barthez mentions a case in which fifteen pounds of mucus were passed in thirty-six hours, and which was cured solely by the exhibition of large doses of opium internally, and in the form of clyster.

If there be any constitutional tendency to gout, colchicum should be administered. The form in which I am in the habit of giving it is the acetous extract, in the dose of one or two grains at bedtime. In these cases, small doses of copaiba, or of the essential oil of cubebs, with hyoscyamus, will often do great good, and may either be added to the infusion of buchu *, or decoction of pareira brava, or be given alone. Some surgeons put great confidence in copaiba in the treatment of this disease.

* R Infus. Diosmæ, ℥ivss. Mucil. G. Acac. ℥j. Olei Essent. Cubeb. ℥j. Tr. Hyoscyami, ℥iiss. Fiat mistura cujus capiat coch. ij. amplater in die. Another form is R Carbon. Ammonizæ ℥ij. Succ. Limonium, q. s. ad saturandum. Tr. Cubeb. ℥j. Syrup. Papav. ℥ss. Infus. Diosmæ, ℥vss. Sumat quartam partem ter in die.

Sir A. Cooper says—"The best remedy that can possibly be taken is the balsam of copaiba; no medicine so completely robs the urine of mucus as this. Eight or ten drops three times a day will usually be found quite sufficient; it may be given in conjunction with sweet spirits of nitre and camphor mixture, or in $\text{ʒij. mucilag. gum. acaciæ et ʒx. aq. font.}$ "

Copaiba may be given with advantage in combination with small doses of zinc, chio turpentine, or sulphate of iron; but whatever other remedies may be used, the surgeon must not omit the use of morphia or opium once or oftener in the twenty-four hours. Dupuytren used to rely very much on turpentine* in this disease. But both cubebs and copaiba must be administered with care; for, after the long-continued use of these medicines, chronic inflammation of the bladder sometimes comes on. I am frequently in the habit of giving the *tinctura Benzoini composita* (in the dose of a teaspoonful), three times a day, with considerable relief to the patient†. When the urine is alkaline, and contains a good deal of mucus with the phosphates, the *alchimella arvensis* may be administered with

* *Terebinthinæ Chiæ*, gr. $\frac{1}{2}$. Extract. *Lupuli vel Conii*, Sap. Hispan. \bar{a} gr. jss. ut sit pilula bis terve in die sumenda; or \mathcal{R} *Terebinthinæ Chiæ*, gr. xij. *Muriatis Morphicæ*, gr. ij. Sap. Hispan. q. s. Misce et divide in pilulas xij. quarum capiat j. ter in die.

† The following is a good form for its exhibition: \mathcal{R} Carbon. Ammoniac \mathfrak{D} ij. Succ. Limonum, q. s. adde Mist. Camphoræ, vel Aquæ distillat. \mathfrak{Z} vss. Tr. Benzoini Co. Syrup. Papav. \mathfrak{Z} ij. Capiat quartam partem ter in die.

advantage. An ounce of the dried plant is to be infused in a pint of boiling water for three or four hours; and two ounces of the infusion are to be taken three times a day. I need not say that in this complaint, blood-letting is seldom required. In the severer form, where there is great depression of the vital powers, the patient should be sustained with light nourishment, and small quantities of wine given from time to time. In the milder form, patients may be allowed to take animal food; but beer, wine and spirits, must be strictly prohibited. Patients must also be cautioned against exposure to cold, and against irregularities of every kind, and must be told the consequences of neglecting the advice given them. From want of care on the patient's part, the mild has often assumed the severe form, and an attack of acute inflammation has come on and destroyed life.

CASE.

In December, 1833, I attended with Mr. Holmes, of the Kingsland Road, Mr. T., æt. 80, who, for some time previous, had been subject to occasional difficulty in passing urine, and to the discharge of mucus, which latterly had very much increased. When I saw him, there was frequent desire to make water, attended with great uneasiness and pain in the lower part of the abdomen, sense of burning in the urethra, inability to micturate, cramps in the legs, thirst, and slight shivering. On drawing off the water, these symptoms subsided

for a time ; but they invariably returned on the filling of the bladder. The urine was acid, of a dark brown colour, and contained a great quantity of mucus more of an amber colour than any other. This always subsided to the bottom of the vessel, was very tenacious on being everted, and could be drawn into long strings. Sometimes this mucus would come out in clots, and it was occasionally streaked with blood, and very offensive to the smell. On exposing some of it to the action of cold for a few hours, it became quite dense.—Morphium, the decoction of uva ursi, with the ammoniated tincture of iron, the decoction of pareira brava, lavements, and the regular introduction of the catheter, were employed, but without avail ; the patient's strength gradually declined ; and he sank at the end of six weeks. There was no post-mortem examination.

CASE.

The following interesting case occurred in the practice of Dr. Elliotson.

For a great number of years, the individual had laboured under cystorrhœa, as it is sometimes called, or a discharge of mucus from the bladder. A great quantity of mucus was constantly deposited in the vessel which he used ; and that it was true mucus was evident, from its capability of being drawn out into long threads. This continued for a number of years, and various remedies were used ; but they were all rendered useless by his taking an

excessive degree of exercise. Any remedy, however, that was at all irritating, did him a great deal of harm: mild means only were suited to him. I am not sure that even these did him any absolute good; but certainly they did him no harm. The consequence of not taking care of himself, and of taking considerable exercise, was, that what at first was a mere increased secretion of the bladder, became at last organic disease of that viscus, slow inflammation, hypertrophy, and finally, pretty active inflammation.

The following were the morbid appearances found on dissection:—The bladder was amazingly thickened: its substance was in a high state of hypertrophy, the muscular fibres being considerably increased in size. There was a very considerable hypertrophy of the muscular coat, mucous membrane, &c., at the part corresponding with the trigone vesicale; so that a large transverse fold was formed by it. This person had from 300 to 400 small stones in the gall-bladder, but he never suffered any inconvenience from them, and their presence was unexpected. He had no stone, no stricture, no difficulty in passing water, but an excessive gleet, if I may say so, from the interior of the bladder, for many years. We could almost fancy, from its rugousness, that the interior of the bladder was the interior of the stomach. The symptoms preceding death were, agonising pain, a constant desire to make water, a discharge of blood as well as of mucus, which at last was rather

pus than mucus. From excessive secretion, there came on chronic inflammation of the substance of the bladder; and finally, that chronic inflammation became acute, and destroyed the patient.

CHAPTER VI.

ACUTE INFLAMMATION OF THE MUSCULAR
STRUCTURE OF THE BLADDER.

SOME authors suppose that the muscular structure of the bladder is never inflamed alone, but that its peritoneal and mucous membrane always at the same time partake of the inflammatory action. Mr. Howship* says, "An acute inflammatory action of the bladder is, I believe, never confined entirely to the muscular coat. Either the mucous membrane within, or the peritoneal covering without, or both, have been always, as far as I have seen, more or less involved in the same state, and consequently the phenomena of irritation become blended with the symptoms of inflammation." Boyer likewise says, "Inflammation of the bladder, like that of all organs composed of several tunics and lined by a mucous membrane, may attack all the tunics at once, or only the internal coat. The first case is termed inflammation of the bladder or cystitis; the second, catarrhal inflammation, or catarrh of the bladder. At all events, it is right to observe, that, in cystitis, the mucous membrane partakes, more or less, of the inflammation; and that, in acute and very intense catarrh of the

* On the Secretion and Excretion of Urine, p. 230.

bladder, the other membranes of the viscus are also inflamed. Hence, without doubt, the difficulty in several cases of distinguishing the symptoms of inflammation of the mucous membrane, from those which belong to the inflamed state of the other membranes." "We must say," observes Mr. Johnson,* "that we have never seen a case in which we were satisfied of the limitation of the inflammation to this coat. That inflammation may, in one instance, be principally seated in one tunic, and that, in another instance, it may be mainly located in another, is too certain to admit of doubt ; but its absolute limitation to one coat and particularly to a central coat, like the muscular, does not seem to us so well established in fact as in theory." Mr. Wilson, on the contrary, in his lectures on the urinary organs, says, "Inflammation may arise from various causes, affecting the whole of the coats ; or it may arise from a cause acting only on one, and may be confined to that single coat." Dr. Prout† says, "authors speak of inflammation, both acute and chronic, of the muscular structure of the bladder. We also read of rheumatic and gouty inflammation of this organ. I have been informed that rheumatic or neuralgic affections of the bladder are well known, and not unfrequent in malarious districts bordering on the tropics ; and I believe that I have seen a few instances of such affections, in this country. In such cases it is probable that the muscular and nervous structures and their ap-

* Medico-Chirurgical Review.

† Op. cit. p. 378.

pendages are the chief seat of the affection. With respect to the existence of gouty inflammation of the bladder, I believe there cannot be two opinions ; and if we take the matter for granted, we must suppose that such inflammation attacks in preference that peculiar structure of the bladder, which is analogous to, or identical with the structure attacked by gouty inflammation in other parts of the body. Whether the mucous membrane be the structure primarily attacked by gouty inflammation, I do not know ; I believe it is not ; but that like the skin in other parts of the body, the mucous membrane (as in cystorrhœa for instance) is only secondarily affected. So far I am willing to allow, that inflammatory excitement, or something which we must denominate inflammatory excitement, may chiefly be confined to the muscular and nearly allied structures of the bladder. I can also understand how ordinary inflammation may involve these structures in common with the rest of the structures of the bladder, but I confess that at present I am quite unacquainted with, and indeed doubt, the existence of the commencement, and particularly the limitation of ordinary inflammation to the muscular structure of this organ." Now, the fact I take to be this— inflammation may confine itself to the mucous tunic, or it may limit its action to the peritoneal covering of the bladder ; but with respect to the muscular coat of this viscus I am of opinion that it is seldom exclusively the seat of inflammation,

unless it be at its very commencement. From the central tunic, inflammation has a great tendency to spread both outwardly and inwardly; and hence it is that we never observe the former to be much inflamed, without finding either or both of the latter more or less involved in the morbid action.

With the exception of inflammation of the bladder, caused either by stone or by the operation to remove it, or proceeding from outward violence or wounds, idiopathic acute inflammation of the muscular membrane of the bladder, is comparatively rare; whilst, on the contrary, affections of the mucous membrane, and even chronic affections of the muscular tissue, are more frequently met with. Hence we find, that few cases of it are noticed by the surgeons of the last century; Vogel even says, "*Nulla fere fit hujus morbi a recentioribus auctoribus mentio.*" It more frequently attacks adults than the young or old, and strong robust persons than delicate ones. It is also more common in males than females, whilst the contrary is the case as to acute inflammation of the mucous membrane.

The patient first complains of a dull aching pain in the region of the bladder, which soon becomes more violent, and extends to the neighbouring organs. This pain is increased by pressure, and is attended by desire to pass urine, without the power to accomplish it. The desire comes on in paroxysms, attended with pain; the urine is at

first evacuated in small quantities ; and the attempt to pass it causes great pain. The small quantity which escapes is of a dark colour, sometimes not unlike coffee in appearance ; at other times it is of a deep red, and even blood colour ; and at last complete retention occurs. There is a sense of fulness in the lower part of the abdomen, and pains in the lumbar region, in the groins and down the thighs ; but there is not the burning sensation along the urethra and in the perineum which exists in inflammation of the mucous membrane.

The disease is ushered in by rigors, which are soon succeeded by great constitutional disturbance. The pulse is full and hard, the thirst great, and the skin hot, with general uneasiness and sickness. If the inflammation increase and spread, pains are felt in the intestines, particularly in the rectum, combined with tenesmus ; delirium comes on ; the pulse rapidly sinks ; and the patient soon dies.

If the inflammation be seated in the neck of the bladder, as is frequently the case, the urine which has entered the bladder, is retained by the tumefaction ensuing from the inflammatory action, and the bladder soon becomes distended and projects above the pubes. There is a sense of weight in the perineum ; there are often painful erections of the penis ; and examination by the rectum gives great pain.

The anatomical structure of this part readily accounts for these symptoms. The triangular

space is at once very vascular and highly sensitive: * its nerves arising from the third and fourth sacral pairs, as well as from the great sympathetic, descend on each side through the inferior mesenteric and the hypogastric plexus, and communicate more particularly upon this space. We have, therefore, only to recollect the relative connexions and ramifications of these different nerves to be able to explain, not merely the strong and constant desire to evacuate the bladder that prevails when this part of the bladder is irritated or inflamed, but also the remote symptoms with which this inflammation is liable to be accompanied.

If the inflammation exists somewhat higher up in the bladder, where the ureters enter, the orifices of the latter become contracted, and the bladder being closed against the influx of the urine, the ureters become enormously distended. The orifice of the ureters is surrounded by a dense elastic substance, which lies between the muscular and the mucous coats of the bladder. Beginning at the base of the triangular space, this substance inclines inwards as it advances towards the neck, forming in a great measure the orifice, and appearing to be continued through the urethral passage as its elastic

* With regard to the urethral opening of the bladder, Mr. Guthrie observes, "that fibres have been described surrounding this part, though no anatomist has demonstrated them so as to warrant their being called a sphincter muscle; that this part may be both muscular and elastic, but that the older anatomists supposed the power which prevented the flow of urine to reside in other muscles surrounding the membranous part of the urethra."

membrane. This elastic triangular substance yields, in some measure, to the pressure of the urine, when impelled by the detrusor, and returns to its original situation when the pressure is removed.

If the inflammation be situated more in the upper part of the bladder, there is danger of its extension to the peritoneum, and the pain is greater on pressure; but the desire to pass urine is not so frequent, nor the difficulty so great.

The progress of the disease depends on the severity of the symptoms. Very severe cases, occurring, for instance, after suppressed gout, sometimes terminate fatally within a short time from the commencement of the attack; but, in ordinary cases, if active measures be employed, the pain, after two or three days, begins to subside, and the water flows with greater facility, is less acid, and of lighter colour. The febrile symptoms, and, at the same time, the local uneasiness, lessen.

This kind of inflammation sometimes terminates in the formation of abscess in the coats of the bladder; of which the symptoms are of a very formidable character, depending upon the size and situation of the abscess. The urgent symptoms of the inflammation then subside; but there is a dull pain in the region of the bladder, occasional rigors with febrile excitement, and uneasiness in passing urine and fæces. The abscess may open into the cavity of the bladder, and in this case, pus is evacuated with the urine, and the patient experi-

ences great relief; or the matter may extend into the cellular tissue of the pelvis, and make its way either through the rectum, or to the perineum, or even to the groin, and in these cases the result is most frequently fatal. Mr. Wilson mentions an interesting case, in which extensive suppuration had taken place in the coats, from the prostate even to the fundus of the bladder, the matter being lodged everywhere between the coats; while near the fundus several ulcerations had penetrated the internal membrane, by which the matter had passed into the cavity of the bladder.

This disease may easily be mistaken for acute inflammation of the prostate. The uneasiness and pain in the region of the bladder and the perineum, the occasional but strong desire to pass urine, every effort being attended with great pain and retention, are symptoms common to both diseases. In inflammation of the prostate, however, there is more fulness and tenderness on pressure in the perineum, and on examination per rectum, the prostate is found exceedingly sensitive, painful, and swollen.

In recent cases, the morbid appearances in acute inflammation of the muscular coat are, great vascularity, the tunic being thoroughly injected with blood, and of dark red colour.

Sometimes this coat is found even to be gangrenous; and instances are recorded where it has given way, and the urine has escaped into the pelvis. The mucous membrane is also found of a dark red colour. In other cases, the membrane is

thickened, and the bladder itself contracted. Pus is found sometimes infiltrated through the tunic, or else circumscribed in the form of abscess.

Acute inflammation of the bladder is sometimes caused by exposure to cold, and indulgence in spirituous liquors; but more frequently it occurs on a sudden suppression of the discharge in gonorrhœa, when metastasis takes place to the bladder.

Amongst its causes may also be classed, wounds and blows, or injuries from the incautious or violent use of instruments. The immoderate use of cantharides internally, and, in excitable persons, even the external application of that medicine, will produce this disease. After an irregular or suppressed attack of gout, this affection comes on, and frequently assumes a very serious and formidable character.

CASE.

Richard Serigiter, æt. sixty-eight, watch-maker, after a slight attack of gout, was seized with rigors, which were succeeded by fever and great constitutional irritation. The pulse was extremely quick; the skin was hot and dry; and there were great thirst and sickness. He had a strong desire coming on in paroxysms to void urine; but he could pass but a few drops at a time. There was pain in the region of the bladder and loins.—Colchicum and saline aperients, were administered; leeches and warm fomentations were applied to the region of the bladder; and the warm bath was tried. The bladder being distended, a catheter was introduced;

and between two and three pints of very dark urine were drawn off. None of these measures gave relief: the constitutional disturbance increased, delirium came on, and the man died within forty-eight hours from the commencement of the attack. On the day after his decease, I examined the body, and found the bladder in a state of intense inflammation: in its structure, there was no organic change; but the tunics, particularly the muscular one, were of very deep red colour. I have the preparation of this case in my possession; and although it has been in spirit several years, it still retains its redness.

The symptoms of this disease are so severe, and its progress so rapid, that prompt and decisive measures must be adopted. If the patient be strong or robust, general blood-letting must be first employed; or, if the patient be delicate, and of spare habit, local bleeding, as leeches to the pubes, or cupping in the perineum, may be substituted; or both of these may be put in requisition as auxiliaries to general blood-letting.

Hot fomentations should be constantly applied to the pubes; and, after the bleeding, the patient should be placed in a hot bath. As already observed there is, in these cases, retention; and the urine must, from time to time, be drawn off by the catheter. Internally, our main reliance must be placed on the use of calomel and opium, which must be given every three or four hours; this medicine affording the most speedy relief. As there is often

tenesmus, the proportion of opium should be large; and sedative injections should, at the same time, be administered. After the urgency of the symptoms has subsided, saline aperients combined with the *vin. semin. colch.* will be found beneficial, especially if the attack have occurred in a gouty subject. The diet must consist entirely of lukewarm mucilaginous drinks. If the complaint have arisen from the suppression of the discharge in gonorrhœa, it will subside on the reappearance of that discharge.

If these means be employed early, the patient soon experiences a diminution of pain. Urine is passed in greater quantities and with less suffering; his constitutional symptoms improve; and he falls into sound and refreshing sleep. If, on the contrary, these measures be delayed, the symptoms before described become aggravated; and delirium and death ensue.

CHAPTER VII.

CHRONIC INFLAMMATION OF THE MUSCULAR
COAT OF THE BLADDER.

It not unfrequently happens that, after an attack of acute inflammation, the bladder never recovers its usual tone, and the chronic form of the disease supervenes. At other times, chronic inflammation exists without having been preceded by the acute form of the disease; but if its history be carefully traced, it will be found that inflammatory symptoms of a sub-acute character have for a long time been going on and neglected, which, though mild at first, have been gradually becoming exasperated, until a disease, which might have been perfectly tractable at its commencement, terminates in one that is extremely distressing, and which, I regret to say, is seldom cured.

In this disease, there is uneasiness about the region of the bladder, frequent desire to make water both night and day, but especially by night, and the urine does not flow so readily as usual; there is also occasional prolapsus of the rectum; and these symptoms are increased by exercise. The patient frequently complains of pains in all the limbs and in the region of the back, of a sen-

sation of bearing down in the region of the bladder, with occasional fulness in the perineum, and a sensation of trickling in the part, of difficulty or slowness in passing urine, and of a claspings or closing effort of the neck of the bladder in the act of micturating, which is increased by the muscular exertion. Occasionally, the bladder feels as if it were full and distended twice its size, even when it contains but little urine. The skin is dry, and suffering under psoriasis or lepra; and the urine is scanty, of deep colour, and of high specific gravity. The kidneys, after a time, are involved in the progress of the disease, the urine becomes albuminous, nausea supervenes, the patient loses flesh and strength, and he sinks at last from complete exhaustion.

In this state, the coats of the bladder become thick and hard, so that they no longer admit of their former degree of extension. Now, it must be understood that the neck of the bladder and the urethra have around them the muscles termed the compressor prostatae, the levator urethrae, and the ejaculator seminis, besides the columns of the levator ani. All these muscles must relax before a drop of urine can pass; and any inflammatory action in them directly obstructs the passage, whilst it hinders the contraction of the bladder itself. The contraction, indeed, of one set of these fibres, and the relaxation of the other, belong to the same act, like the condition of opposing muscles in the motions of the limbs; so that if the bladder be not

in a state to execute its functions, these muscles are not in a condition to relax. “The elasticity of the neck of the bladder,” says Mr. Guthrie *, “is impaired ; it will not dilate with the ordinary action of the detrusor muscle ; and this action is therefore augmented. A sensibly increased delay is experienced before the water begins to flow, the patient is obliged to expel it ; and he becomes conscious of the augmented effort made by the bladder. The desire in which this originates, soon amounts to uneasiness, and rapidly afterwards, to pain—relieved indeed on evacuating a little water, but too soon to return ; for now the bladder is never completely emptied, and the urine which remains is a source of great irritation, although the quantity be really inconsiderable.”

On dissection, the bladder will be found more or less thickened ; its inner surface presenting a considerable number of rugæ, caused by projection of the enlarged fasciculi beneath. Dr. Baillie has given the representation of a bladder nearly an inch in thickness ; the prostate gland being at the same time enlarged. One of the most ordinary changes in the bladder, from its natural structure, says that physician, is the great thickening of its muscular coat. In a natural state, the muscular coat of the bladder, when it is moderately distended, consists of thin layers of muscular fibres, running in different directions. These are probably, altogether, not more than the eighth of an inch in

* On the Diseases of the Bladder, Lect. xv. p. 256.

thickness. The muscular coat of the bladder, however, is occasionally found at least half an inch thick. This arises from an additional quantity of muscle being formed in consequence of extraordinary efforts being necessary in the bladder. These efforts take place when there is any considerable difficulty in making water, as happens when the prostate is a good deal enlarged, when there is a stone in the bladder, or when there are strictures in the urethra. It is usual, therefore to find this thickening of the muscular coat, when there is any of these diseases. When the bladder is thickened, the fasciculi of which its muscular coat is composed become much larger; but they never, or at least very seldom, acquire the full red colour which muscles of the same size have in other parts of the body. This is a deviation from the general plan of nature with regard to the increase of muscles from exercise. When muscles are enlarged in size from exercise, they also become of a deep red colour. There is no instance in the body, as far as I recollect, of a muscle being so much enlarged beyond its natural size in consequence of increased exertion, as the muscular coat of the bladder. Between the fasciculi of the muscular fibres, little pouches are formed by the inner membrane of the bladder, which is impelled by the strong powers of the muscular coat. These pouches are often large enough to admit the end of the finger, and contain occasionally small calculi. The bladder in this state admits of very little

distension, so that it is capable of containing little water: hence the inclination to make water is frequent, and frequent efforts of the muscular coat are required, which increase more and more its thickness. When the disease has been of long duration, and severe at the same time, the mucous lining of the bladder becomes partially or wholly abraded, exposing the hypertrophied muscular fasciculi. Mr. Guthrie thinks this a rare occurrence: from my experience, I am inclined to draw an opposite conclusion, and do not consider it so uncommon a disease. When the mucous tunic is abraded on the spot where the ureters terminate, the inflammatory action and its consequences extend up these tubes to the corresponding kidneys, and hence we not unfrequently find the pelvis of one or both of the kidneys ulcerated, as well as the interior of the bladder.

This disease, though frequently the sequel of acute inflammation, is also caused by strictures in the urethra, enlargement of the prostate, prostatic calculi, cold, stone, indulgence in spirituous liquors, by irritating medicines, as cantharides, and, in some constitutions, by the long continued use of cubebs and copaiba. In persons having an hereditary predisposition to urinary affections, as well as in gouty and rheumatic subjects, it occurs from slight causes. The retention of urine in the bladder, after the desire to void it has been felt, often brings on the disease.

This affection is likely to be confounded with

simple irritation of the bladder; but the absence of pain, and of the constitutional symptoms I have described, are the great diagnostic signs.

Hysterical females are subject to a peculiar form of irritation of the bladder, which I have known in more instances than one to have been mistaken for inflammation. In these cases, there is usually great pain, and even retention of urine; but the temperament or constitution of the patient, and other characteristic circumstances, when carefully inquired into, will in most instances clearly show the true nature of the disease.

When this disease is caused by stricture or any local cause, it is clear that the primary affection should especially engage our attention; though even when that has been removed, the inflammatory disease often remains. In gouty, rheumatic, or plethoric persons, colchicum given at night, in the dose of one or two grains of the acetous extract, will be found of great service; and as, in these cases, the urine is acid, and often scanty, the alkalies should also be given. I usually advise them to be taken after meals; and I employ them in a combination of bicarbonate of potass, sesquicarbonate of soda, and nitrate of potass. In addition to these medicines, great benefit will be derived from *pareira brava*. Some years ago, I published some cases of the disease which were relieved by this remedy; and subsequent experience has quite confirmed the opinion which I then ventured to express of it. This medicine formerly

had a place in the Pharmacopœia; and, after being omitted for a time, it is restored to the edition which has recently appeared. In the beginning of last century, it was, in many parts of Europe, in great repute; and, in a work published at that period by Andreas Helvetius, it is mentioned as a specific in affections of the bladder and kidneys: his observations are, “*La racine de pareira brava est un spécifique contre toutes les maladies des reins et de la vessie qui sont curables. Il agit avec tant de douceur qu’il n’y a point d’occasion où l’on ne puisse l’employer sans en craindre de mauvaises suites, et on peut comparer ses effets aux spécifiques du quinquina, de l’hypécacuanha, &c.*” *

The mode of preparing this medicine, advised in the present Pharmacopœia, is to put six drachms of the root into a pint of water and to macerate it for two hours. I usually, however, order a decoction—an ounce to a pint and half of water, to be boiled to a pint.

The extract of pareira brava is also a very useful medicine, and may be given in doses of ten grains, three times a day.

I have often, with great advantage, tried the infusion of wild carrot seeds in this form of disease; but this medicine should not be given nor persisted in, if there be any irritation of the mucous membrane.

* *Traité des Maladies les plus fréquentes, &c., par M. Helvétius, Liège, 1711.*

The diosma, in the form of infusion, combined with the alkalies and tincture of hyoscyamus, will be found of great service. Should not the urine be acid, or, as is not unfrequently the case, should the alkalies produce headache and restlessness, or uneasiness about the region of the stomach, their use must be discontinued, and recourse had only to sedatives, as extract of hop, and of uva ursi, or nitric ether, with tinctur. camph. comp. ; and the occasional exhibition of suppositories. The diet should be plain, but nutritious ; and beer, wine, and spirits, should be prohibited. Exposure to wet and cold invariably aggravates this disease, and should, of course, be avoided.

As in these cases the bladder is seldom completely emptied by its own efforts, a catheter should be introduced from time to time, and the patient be instructed to do this for himself. Unless this direction be strictly attended to, the patient is not only certain of not improving, but the chances are that he will become worse, and serious consequences ensue.

CHAPTER VIII.

INFLAMMATION OF THE PERITONEAL COAT OF
THE BLADDER, AND OF THE SUBJACENT CEL-
LULAR TISSUE.

INFLAMMATION of the peritoneal covering is seldom confined to the bladder, but generally extends over the whole of the membrane. It is often the close of a fatal disease of that viscus. That it takes place, however, under other circumstances, without any dangerous consequences, is sufficiently proved by old adhesions not unfrequently found connecting this part to the omentum, to portions of the intestine, to the uterus, or to the rectum.

On dissection, we not unfrequently find the abdominal or peritoneal tunic of the bladder inflamed, as well as the mucous and muscular coats. Inflammation sometimes attacks the peritoneal covering, owing to that action spreading to it from another part of the membrane. Nevertheless, though the circumstance is rare, cases have occurred in which acute inflammation was limited to the peritoneal tunic of this organ.

As a reason for limitation to this particular tunic, Dr. Baillie suggests the quantity of cellular tissue

interposed between the serous and muscular tunic, and the laxity of their connexion.

The pain and its aggravation on pressure, the state of the pulse, the countenance, and the position of the body, clearly indicate the nature of the disease.

The same treatment which is employed in general peritonitis, must be adopted in inflammation of the peritoneal covering of the bladder.

The lancet, leeches, calomel and opium, and warm applications, must be vigorously employed. The disease rarely, if ever, proceeds to suppuration; but coagulated lymph is sometimes thrown out on the inflamed surface, forming adhesions with some other part of the peritoneum, where it covers other viscera, or lines the cavity of the abdomen.

The inflammation of the external covering of the bladder is, moreover, generally connected with inflammation of the adjoining lining of the pelvis.

In these cases there occurs a peculiar train of symptoms, requiring a different plan of treatment from that suited to inflammation of the peritoneal coat of the bladder.

“The pulse,” says Sir B. Brodie*, “is frequent, rising to 93 or 100, and at last to 140, in a minute; the heat of skin is great; the tongue dry; the countenance anxious. There is an occasional hiccup; the patient complains of some degree of tenderness in the lower part of the abdomen; the belly becomes tympanitic; its distension increases;

* Lectures on the Diseases of the Urinary Organs, p. 328.

the hiccups are more frequent ; the pulse intermits, becomes weak and fluttering. In some instances, the patient retains his understanding, even to the last ; while in others, he falls into a state of low delirium previous to death. Occasionally, in the progress of such a case, the patient has a severe rigor, and sometimes he complains of pain in the loins. On dissection, we find the cellular membrane round the neck of the bladder, and between the prostate and rectum, bearing marks of inflammation, infiltrated with lymph and serum, and to a greater or lesser extent converted into a slough. If death have taken place at an early period, the intestines are found inflated with air, and there is a very slight effusion of serum in that part of the peritoneum which descends into the pelvis. But if the patient have laboured under these symptoms for many days before he dies, the peritoneum, where reflected from the bladder to the rectum, is seen of a darker colour than natural, and encrusted with lymph ; and at a still later period, there is the appearance of inflammation, to a greater or less extent, throughout the peritoneum generally. But the peritoneal inflammation is evidently not the primary disease : it is the inflammation and sloughing of the cellular membrane of the pelvis, which has induced inflammation of the adjoining portion of that membrane.

“ It is important that we should not fall into the error of regarding these cases, as cases of simple peritoneal inflammation ; for the remedies which

would be useful in the latter case are useless here. The abstraction of blood, even the operation of an active purgative, will cause the patient to sink more rapidly, tending only to hasten his death. The proper system to be pursued is the opposite of that to depletion. The patient should take such nutriment as his stomach is capable of digesting. The bowels may be kept open by injections, or by the exhibition of some very gentle purgative; and ammonia, wine and brandy, are to be administered when the state of the general system indicates that stimulants are necessary."

Sometimes the cellular tissue around the bladder is the seat of chronic disease; and abscesses may form in different parts of it, without the bladder being affected. These cases are always involved in great obscurity, and they often terminate fatally.

Dr. Elliotson* relates the case of a female forty-two years of age, in whom an abscess formed between the bladder and the symphysis pubis, which terminated fatally in about two months from the commencement of the disease. She complained of violent pain in the hypogastrium and over the pubes, shooting back to the loins, and frequently attended with a sensation of numbness and tingling in the right thigh extending to the toes. The hypogastrium and pubes were very tender to the touch; there was, occasionally, a copious discharge of puriform matter from the vagina, tinged with blood; and the urine generally passed freely, but

* Medical Gazette, vol. i. p. 130.

had sometimes been retained for two days together. There was much tenesmus with pain in the rectum ; the tongue was white ; there was no appetite, but frequent nausea ; the bowels were usually opened twice a-day, and the pulse was weak and small.

On examination, an abscess was found in front and deeply behind the symphysis of the pubes, extending laterally beyond the abdominal rings, so that the round ligaments passed through it. The surface of the bone, was rough, blackened, and denuded of its periosteum, but not carious. The abscess contained a dark-coloured and very fetid pus, which had free exit through the urethra, a portion of the whole circumference of which was here destroyed. The suppuration was entirely anterior to the bladder, which was rather turned to the right side, but, with the uterus and vagina, was perfectly healthy. The pelvis was large and well-proportioned.

CHAPTER IX.

SPASM OF THE BLADDER.

IT has been questioned by some medical writers, whether the bladder be subject to spasm; a little attention to the organization of the part will, I think, remove all doubt on the subject. No truth in physiology is better established than that of structure determining the function of parts; and whether that function be healthy or morbid, the phenomena it presents in both cases may differ in the degree and quality of their manifestation, but never in their essential nature. Now, the characteristic function of muscle is contraction and relaxation, alternating in health as occasion requires; while in disease, either may be too great, giving rise to spasm in one instance, or to debility or total paralysis in the other.

The bladder, therefore, being plentifully supplied with muscular fasciculi, traversing its structure in various directions, is as liable to be affected with spasm as any other muscular structure.

The disease comes on in fits, and the attack is for the most part sudden: the character of the accompanying pain is likewise very striking, cor-

responding with what is felt in other muscular organs subject to spasm. The pain is usually very violent, almost insupportable; and during the continuance of the spasm, the peculiar function of the bladder is variously disordered, according to the particular set of fibres involved in the morbid affection. For example, if the fasciculi situated at the fundus and upper part of the bladder be the chief seat of the spasm, then it often happens that the contents of the bladder are suddenly and forcibly expelled on the first accession of the spasm: whereas, if the disease seizes on the neck of the bladder, the very reverse ensues—the urine is retained so long as the spasm persists.

There is one affection of the bladder with which spasm is apt to be confounded. I mean, acute inflammation of the muscular structure of the bladder. In inflammation, the pain is constant, coming on with more of uneasiness than of positive pain, and exasperating by degrees; while in spasm, the seizure is as severe as it is sudden. In the former, the pain has the characters usual in inflammations—it is lancinating and throbbing; whereas in the latter, it is constrictive, resembling, in fact, labour-pains. In both there usually is retention of urine, but the cause in each case somewhat differs: in spasm, seated above the neck of the bladder, the spastic contraction of the sphincter vesicæ prevents the urine from being evacuated; in inflammation of the same part, on

the other hand, it is the tumefaction of the muscular coat and continuous cellular membrane that is the cause of the obstruction. A distinction between spasm and inflammation affecting the bladder, may be partly deduced from the age of the patient, as it is the young and robust that are most liable to be attacked by inflammation, and the aged, the nervous, and debilitated that are most subject to spasm. The colour of the urine in the two cases is likewise a diagnostic sign; since in the former disease it is red and high-coloured, while in the latter it is watery and pale, especially if there be no organic affections, at the same time, in either the bladder, uterus, or kidney.

Old people are more particularly subject to this disease. A fit of the stone, as it is familiarly called, is nothing but a violent paroxysm of spasm, attended with intolerable pain, excited by the irritation of the calculus. This is frequently produced by the position of the stone being disturbed either by a slip of the foot in walking, or any violent concussion of the frame. In fact, whatever throws the abdominal muscles suddenly and violently into action, by the compression of which, the bladder is made spastically to contract on the stone, causes an attack: even the emptying of the bladder in such cases is usually followed by slight spasm, extending to the extremity of the urethra; and hence the pain which is sympathetically felt in the glans immediately after

micturition. The spasm is, for the most part, not confined to the bladder alone: on the contrary, it sometimes affects the rectum, causing it to expel its contents suddenly, and, in spite of the patient, occasionally contracting so violently as to cause its own eversion. At other times, the spasm of the bladder shuts up the orifices of the ureters, and thus prevents the urine secreted by the kidneys from finding its way into its natural receptacle, the bladder; in consequence of which, the ureters and pelvis of the kidneys become greatly distended, accompanied by severe pain in the loins and down the thighs: but the most frequent line of the spasmodic extension is along the course of the urethra, indicated by the violent pain felt in the whole length of the passage; and there is a constant desire to void urine without the ability.

The agony experienced by the continuance of the spasm is excessive, and, if not relieved, is followed by a train of the most dangerous symptoms, the patient evincing the greatest anxiety, and his whole body being bedewed with a cold clammy sweat. Attacks of this kind are apt to terminate in inflammation, or, if frequently repeated, in exhaustion of the patient: febrile disturbance is set up in the system; and when these seizures recur in the aged and infirm, they almost always prove fatal: the patient faints away, or is attacked with convulsions, or apoplexy.

Spasm of the bladder, as we have seen, is most usually a sympathetic affection: it is at times

sympathetic of hysteria; and when it has been so, I have known it to be mistaken for inflammation, and the treatment adopted has consequently been most pernicious: indeed, I knew one patient who, from the long-continued erroneous treatment pursued, was reduced to the utmost extremity; for, as the plan of cure was the one most certain to increase the nervous irritation, the attacks of spasm were the more frequent the longer it was continued.

This disease is almost invariably a concomitant of stone in the bladder, originating in the manner and from the causes already stated: and it is a very common attendant on gonorrhœa, especially when injections have been employed either too strong or too early in the treatment: in the latter instance the disease affects the sphincter vesicæ more especially, and usually is attended with more or less of inflammation.

Frequent recurrence of spasm of the bladder sometimes injures its tone so much, as to eventually induce an opposite state of the muscular fibres: in other words, the disease terminates in paralysis of the bladder.

With respect to the treatment of the disease, this necessarily varies with the cause in which it originates. If spasm be conjoined with inflammation, we are called upon to adopt a strict antiphlogistic mode of cure: leeches are to be applied over the pubes, or to the perineum; if the symptoms be violent, and go on increasing in intensity, venesection

tion must be had recourse to, and repeated if demanded by the urgency of the case. These means are to be followed by the warm bath, local fomentations, and opiates, which are to be administered both by the mouth and in the form of enemata.

If there be reason to believe the affection to originate in a gouty diathesis, or to owe its presence to a suppression of a paroxysm of this disease, while we endeavour to allay the symptoms affecting the bladder, we are to strive at the same time to induce the gout to make its appearance ; for which purpose we should apply sinapisms to the feet, and blisters to the calves of the legs. The operation, indeed, of the latter affords, as Soemmering has already observed, a diagnostic peculiarity, from their often proving most beneficial in the removal of a morbid state of the bladder, which otherwise they are so apt to induce. Among the palliatives of the symptoms affecting the bladder, I have found none more efficacious than a combination of colchicum, opium, and camphor, or hyoscyamus. As soon as we have got rid of the arthritic strangury, we are to direct our attention to the systematic treatment of the disease, to avert its recurrence.

In cases where the cause of the disease is attributable to the improper use of injections in urethritis, the treatment does not differ in principle from that laid down for spasm combined with inflammation. It will rarely happen that general bleeding will be required ; but as the effect

of strong injections usually is to stop the discharge, we are to use every soothing means to procure its return.

If the cause of the spasm proceed from the kidney, our plan of treatment, after removing present symptoms, must be founded on the removal of the original source of the affection ; since, as far as the spasm is concerned, we can never expect to prevent its recurrence, but by the cure of the disease from whence it proceeds.

The same observations apply when spasm of the bladder arises from the presence of a calculus. Our treatment can only be palliative and of a temporising nature ; for nothing but the extraction of the stone can be relied upon for a permanent cure. As an immediate means of relief, no medicine is preferable to opiates, which may be exhibited by the mouth, or in the form of enema or suppository.

In all cases the introduction of instruments into the bladder ought to be sedulously avoided, unless where it has become necessary to ascertain whether a stone be in the bladder or not.

In cases of spasm of the bladder proceeding from sympathy with some contiguous organ that derives its nerves from the same source, the *tinctura ferri sesquichloridi* often proves of great service. The sphincter vesicæ is commonly the seat of the spasm, and with it we consequently have retention of urine. The operation, therefore, of the remedy appears to be purely antispasmodic, and its influ-

ence frequently is almost immediate. The usual mode of administering it is to give from fifteen to thirty minims every quarter of an hour until the spasm yields.

There are several other topical means besides those enumerated above that may be resorted to. Where there is reason for suspecting that the acrid quality of the urine is a main exciting cause of the spasm, the indication of diluting the urine by drinking freely of some diuretic beverage is obvious; and when acidity is its predominant character, this must be abated by exhibiting alkalies with the diluent: or if strongly alkalescent, this must be altered by the administration of some mineral acid.

A poultice containing powdered camphor is frequently very serviceable when applied to the perineum. Some recommend a liniment, composed of camphor and opium, to be rubbed on the same part. Emollient glysters containing some of the watery extract of opium often afford instant relief.

A tobacco enema has been recommended by some in cases of strangury in old people; but it is at all times a dangerous remedy, and, in my opinion, ought never to be employed. Others have given the same medicine by the mouth. It is one of the most powerful of the antispasmodics, it must be granted; but its efficacy is uncertain, and its hazardous properties unequivocal.

In all obstinate cases we are to watch lest in-

flammation supervene: in which case we must immediately have recourse to bleeding both general and topical, and rigorously adopt all the other means known to abate and remove inflammatory action.

CHAPTER X.

FUNGUS HÆMATODES, AND CANCER OF THE
BLADDER.

FUNGIOUS excrescences occasionally arise from the internal surface of the bladder, and are productive of symptoms of the most distressing nature, and often very similar to many of those which attend cases of stone. Fungous tumours of the bladder are of various kinds; some being merely projections from the mucous lining of this organ proceeding from a single pedicle—occasionally from several; others take their origin from the deeper-seated tissues; many are connected with the prostate; but perhaps their most frequent seat is the fundus of the bladder. They vary likewise in size; some being, when solitary, as large as a goose's egg, of which Lusitanus narrates an instance: *—when they are numerous, they are usually, at the same time, small; a remarkable case of which is to be found in Desault. †

The cause most frequently traceable as giving rise to fungous formations in the bladder, is any long-continued source of irritation; and among those none are of more frequent occurrence than

* Prax. Med. lib. ii. obs. 71.

† Op. cit.

stone. It is a disease which most commonly affects adults, although children are far from being exempt from it.

Their structure differs even more than their size : in some it is steatomatous or medullary ; in others, cartilaginous ; some have all the characters of carcinoma, others are soft and vascular, and polypous ; some, on the contrary, are calcareous both in texture and substance. In certain situations, as that immediately behind the neck of the bladder, they, by blocking up its urethral opening, cause considerable obstruction to the passage of urine ; and the bladder being thereby irritated, and frequently excited to stronger action than in a healthy state, its muscular coat becomesthickened. These excrescences are sometimes attended with discharge of blood and of viscid ropy mucus, the result of the irritation of the inner membrane of the bladder, as well as with pain along the urethra, and at the glans penis. The glands in the groins and pelvis, usually become enlarged.

“There is a malignant medullary fungus,” says Mr. Travers,* “of the mucous coat of the bladder, resembling that of the nares and uterus, breaking, bleeding, and re-produced as quickly as it is displaced. It is of very extensive attachment, and gradually reduces the cavity to very small dimensions. Portions of fungus and coagula of blood become plugged in the urethra, and form firm pellets, so as to produce retention. It is a very

* Medico-Chirurgical Transactions, vol. xvii.

painful disease: it keeps the patient in constant anxiety to void urine, which is more or less tinged with blood; and frequently he passes blood alone. He dies hectic and wasted."

In a case of fungus hæmatodes, which Mr. Mayo examined with the late Mr. Wilson, and in which, from pain in the bladder and occasional discharge of blood, the existence of stone had been suspected, a fungus was found attached by a narrow pedicle to the mucous membrane: the texture of the fungus was soft, and its surface shreddy and ragged. In one of the same gentleman's patients, who died in the Middlesex Hospital, with medullary sarcoma affecting the uterus and the neighbouring part of the vagina, the bladder was studded with white tubercles, about the size of peas, which had formed behind the mucous coat, but projected inwards. They appeared, when cut through, to consist of medullary texture similar to that which grew from the uterus and vagina.

A discharge of blood with the urine, observes Warren,* is the first sign of this disease. The quantity is, at first, so small as scarcely to tinge the urine, but it gradually increases till it becomes a formidable and exhausting symptom. There is but little pain attending it; but this symptom varies in different cases, both of fungus and scirrhus, some cases going through their course with a very moderate degree of pain. Constant desire to pass urine is one of the most dis-

* On Tumours, p. 393.

tressing consequences of this affection ; and this is accompanied with sympathetic irritation of the rectum, and inclination to stool. The disease comes to a fatal issue rather from the consequent derangement of the stomach and intestines, than from pain or hæmorrhage.

The existence of fungous excrescences from the internal surface of the bladder, may perhaps, by the introduction of a catheter, be ascertained during life in some instances ; but, in general, we are never certain of the nature of the disease till the parts are examined after death.

“ In these cases,” says Sir B. Brodie, “ the patient complains of frequent inclination to void urine, and of an uneasy sensation which he refers to the neck of the bladder, and which sometimes amounts to severe pain, extending in one direction to the perineum, and along the urethra to the glans, and in another direction to the pubes. This pain is generally aggravated after the urine is voided. In one case, I have known the patient to labour under retention of urine in consequence of the tumour pressing on the inner orifice of the urethra ; so that it may become necessary to puncture the bladder above the pubes. In another case, there was a constant wearing pain in the loins, the cause of which was explained by the appearances observed in examination post mortem, the tumour having obstructed the orifices of the ureters, which were consequently dilated to the size of the small intestine, the pelves and infundibula of the kidneys

being dilated also, so as to form considerable sacs or pouches, distended with urine.

In these cases, there is always a disposition to hæmorrhage, and it is sometimes so great as to be the immediate cause of the patient's death. The urine, moreover, often contains small portions of the medullary matter.

"A polypus," says Dr. Baillie, "sometimes grows from the internal surface of the bladder; but this morbid appearance occurs very rarely. I have seen only one example of it; and, in that instance, it filled up the greater part of the cavity of the bladder. It was very irregular in its shape, consisting of various projecting masses, and it seemed pretty firm in its texture."—The symptoms which belong to polypus in the bladder are unknown to me; but they are probably much the same with those which attend fungous excrescences in that viscus.

When cancer affects the bladder, it proceeds most usually from the extension of the morbid action from some adjoining viscus, as the womb or rectum; but as an idiopathic and primary affection it is of exceeding rare occurrence,—so much so, indeed, that Soemmering has almost gone the length of denying its existence. There are, however, cases of carcinoma of the bladder on record too well attested to doubt their occasional occurrence*.

The symptoms of this disease are those usually indicating its presence elsewhere: there is the

* See Lallemand and Desault on the Diseases of the Urinary Organs.

acute lancinating pain which characterises cancerous action, and when ulceration takes place, the nature and appearance of the matter discharged affords another diagnostic distinction.

The common seats of this disease are the fundus and neck of the bladder. Cancer of the bladder always proves fatal eventually, and presents on dissection a hard medullary disorganisation often studded with excrescent vegetations.

In some cases of cancer of the rectum in men, and of the womb in females, the disease is communicated to the bladder; ulceration of that organ takes place; and a communication is established between the rectum and the bladder, and between this last and the vagina,—a circumstance which renders the patient's state deplorable. It is doubtful, however, whether the ulceration be of a true scirrhus character. In the paper just quoted, Mr. Travers says, "Scirrhus-cancerous ulceration of the bladder, I never saw; scrofulous, often, particularly in children. When the bladder adheres extensively to the rectum in cancer of the latter, and when they communicate by a fistulous aperture, so that air passes by the urethra as well as feculent urine, I have not seen the coats of the bladder presenting the appearance of scirrhus cancer. The vagina and rectum in the female, on the contrary, are indistinguishably affected by the scirrhus ulcer and fungus."

In these cases, to allay pain and irritation by the use of sedatives, taken internally, as well as in the

form of suppositories or injections, introduced per anum, is all that we can do.

The bleeding is sometimes so copious, as materially to exhaust the powers of the patient. In such cases, our endeavours must be directed to restrain the bleeding *, while we sustain the powers of life without increasing local excitement. Astringents should be given internally; and the patient should be kept in the horizontal position. On the necessity of keeping the patient in this position too much stress cannot be laid; for, in severe hæmorrhage from the bladder, especially in old persons, syncope has come on whilst the patient has been sitting up, or exerting himself; and death has occurred. The powers of life are generally much exhausted; and the urine is often alkaline, and contains albumen, and a large proportion of the phosphates.

If, in these cases, the urine be very alkaline, the decoction of *pareira brava*, with nitric acid, will be very serviceable: on the contrary, if the urine become acid, *uva ursi*, with the fixed or volatile alkalies, will be the most appropriate remedy.

* The following will be found very serviceable in these cases:—*R*
Infus. Rosæ Comp. ℥vj; *Aluminis pulv.* ʒss; *Gallarum pulv.* ʒiiss;
Acid. sulph. dil. ʒi. *Mix.* Two table-spoonsful to be taken every four hours.

CHAPTER XI.

VESICAL CALCULI.

CALCULUS is more common in temperate than in warm or very cold climates; and is much more incident to early years than to any other period; and to old age more than to the prime of life. Hippocrates notices the fact, that infants at the breast are not exempt from the disease; and our old English author, Philip Barrough, in his *Methode of Physick**, observes, "Stones in the bladder do ingender oftener in children than in older folke." Among those beyond middle age, stone occurs more frequently in persons of sedentary habits than in those who lead an active life, and much more in those who indulge in luxurious living than in the temperate and abstemious: a marked connexion has hence been long observed between a calculous and a gouty tendency†. However, although the rich, the luxurious, and the indolent, are at a certain age more prone to calculus than other classes, the poor and the destitute in

* Lib. iii. c. 41, edit. quinta, 1617.

† "Stone is commonly the constant companion of gout"—(Sydenham, Epidem. 1675-80)—an observation which he repeats in his epistle to Dr. William Cole.—See also Schroeder and Rupp, "Disp. de Cognatione inter Arthritidem et Calculum." 1767.

early years enjoy no immunity from it; for the ill-fed and half-clothed children of the manufacturing and labouring population are frequently afflicted with stone. All authors who have written on this subject concur in stating, that females, notwithstanding their sedentary habits, are much less subject to calculus than males; and one reason for this is apparent, besides their more temperate and regular mode of life, namely, the lesser complexity in the form and construction of the urethra in females than in males, its more dilatable nature, and the absence of the prostate gland. When a calculus descends from the kidney into the bladder, or when a nucleus by any accident is formed in that viscus, in the female, it is most usually expelled during micturition, by the mere efforts of the bladder to empty itself, and it is surprising to what an extent the female urethra is sometimes spontaneously distended. Tulpius (l. iii. obs. 7) relates the case of a lady, aged eighty-nine, who spontaneously passed a calculus per urethram, weighing three ounces and two drachms; but it appears to have paralysed the sphincter vesicæ, as she was ever afterwards troubled with incontinence of urine.

It is a popular belief that water strongly impregnated with calcareous matter is apt to produce stone, and the prevalence of this disease in Paris countenances the supposition—a supposition which even the philosophical Hales entertained. But were this a cause, calculous disorders would be far more frequent than they are. The water of the Seine

abounds with carbonate of lime, and were the disease attributable to the drinking of it, we should naturally expect that the nature of the calculi would correspond with the character and quality of the water; but we know that this is not the case, and few calculi are more rare than those composed of the carbonate of lime.

Calculous disorders are very common in Holland, and the circumstance is the more curious, considering that gin, a powerful diuretic, is the spirit most in use in that country. Nevertheless, among the Dutch who come from Europe, and inhabit Batavia, (Java,) stone is a very rare disease, although their manner of living does not differ from that pursued at home. Denys, who resided in that island for some years, tells us, that he could find only two persons who were obliged to submit to the operation of lithotomy. He further observes, that the water they drink, flowing from the neighbouring mountains, is much impregnated with earthy matters.

Calculous diseases are well known to prevail in Norfolk, more than in any other county in England; the cause of this greater prevalence there is, however, not yet ascertained. According to Soemmering, these affections are, on the contrary, altogether unknown in some situations bordering on the Rhine.

There is not any body to which the elements of a calculus are more easily united than to a calculus itself. Whence, if a small stone formed in the

kidney, should descend through the ureter into the bladder, unless it be soon voided, it will in a short time increase in bulk, by the daily apposition of fresh calculous particles; for which reason, a renal stone is most frequently the basis of one in the bladder; and Denys declares, that all whom he had cut for the stone had first felt symptoms of it in the kidneys.

It had long been believed by medical authorities of the highest estimation, even before the chemistry of calculous concretions was understood, that acids and acescents were among the most active causes of gravel. And since chemistry has advanced, and a more intimate knowledge of the sources of disease has been attained, pathologists have discovered a new and more hidden cause of urinary concretions in acidity generated in the alimentary canal, from a morbid condition of the digestion*. It is to this latter source that lithic acid has been traced; and all know how large a share this has in the composition of stones in the bladder.

Van Swieten (Comm. on Aph. 1414) gives a very lucid account of the origin and growth of calculi. "Stones," he says, "proceed from elementary principles, which, under the appearance of a fluid, previously existed in the humours; and when these meet with an indissoluble basis, they fix themselves thereto and form a calculus, which

* "Wherever," says that accurate pathologist, Murray Forbes, "sour fermented liquors are a common beverage, stone and gravel have been observed to be more than usually frequent."

continually increases in bulk, from the application of fresh calculous matter."

Cheselden, in his *Anatomy of the Human Body*, represents two extraordinary calculi found in the bladder. One was cut out from the bladder of a soldier in St. Thomas's Hospital, the nucleus of which consisted of a bullet that had been discharged from a musket and lodged in the bladder; the other was extracted from a boy, five years of age, and when broken, discovered a needle in its centre. The celebrated Nuck * demonstrated the growth of calculi by an experiment. Having opened the abdomen of a live dog, he drew the bladder out of the wound, and made an incision in the bottom with a sharp knife. Through this wound he introduced a little round wooden button; and as soon as the fibres of the bladder were in a state of contraction, he replaced the bladder in its natural situation, and sewed up the wound. The animal, for the first two days, seemed dull and sick; but in a little time the natural appetite and alacrity returned, and the only uneasiness observed, was a more frequent inclination to make water than usual. Some weeks after he dissected the dog in his private theatre, and the button being extracted, appeared covered over with a calculous crust.

Dr. Wells† gives the case of a man in whom sounding detected the presence of a calculus, and

* Adenograph. Curios. p. 80.

† Trans. of a Soc. for the Improvement of Med. and Chir. Knowledge, vol. iii. p. 192.

his urine deposited "a white powdery sediment." "This," he adds, "I examined, and found to consist of the urate of ammonia." The patient eventually died, when, on analysis, "the whole of the calculus, except the nucleus, was composed of the triple phosphate of magnesia and ammonia. The nucleus, which was very small, consisted of uric acid."

Calcareous depositions are not confined to the pelvis of the kidneys or bladder: they have also been found in the heart. Hottinger relates a case in the *Ephem. German.* in which a congeries of whitish stones was found in the right ventricle of the heart of a man who had died of dropsy. Bonetus (*Sepulchretum*, l. ii. s. 8, obs. 15) cites a case wherein three calculi were found in the septum of an enlarged heart of a youth, who, while alive, was troubled with so loud a palpitation as to be audible to bystanders*.

Singular, as it certainly is, that stones should be found in the heart, it seems no less so that they should be found in the blood-vessels: and yet this has happened. Cheselden, in his *Anatomy*, (fig. xxx,) delineates two calculi which were taken from about the origin of the aorta. Hoffman† relates a case of a Batavian nobleman, who, during his lifetime, was afflicted with a most obstinate pain, for

* In *Mantissa Obs. Select.*

† See also, in the *Phil. Trans.* for 1665, the case of Lord Balcarras, in whom two calculi were discovered towards the base of the heart, between the right and left ventricle.

which he could get no relief. On opening the body after death, the kidneys were found quite sound and without calculi, but at the bifurcation of the aorta six unguiform calculi presented themselves.

Greiselius likewise relates that, on opening a vein in the arm of a man seventy-two years of age, who was troubled with catarrh, four stones passed with the blood into the basin; and Bettus, in his appendix to his work on the nature of the blood, mentions a similar occurrence from a vein on the external ankle.

If, as we have seen, calculi are formed in the cavities of the heart and arteries, we cannot be surprised to find them also in the different viscera: indeed, no viscus can be said to be exempt from attacks of such morbid depositions. They are found in the lungs, and are frequently expectorated in coughing; in the thymus gland; in the liver, spleen, and pancreas, and in the mesentery. Valentine relates a singular case of a calculus being met with in one of the vesiculæ seminales, which is preserved in the museum at Frankfort. Not less rare and curious is the generation of calculi in the uterus; and yet Hippocrates mentions this fact in his book *De Morbis Popularibus*; these calculi, Ramazzini very ingeniously conjectures, had found their way by passing from the urethra into the womb.

Calculi have been found in the brain, especially of oxen.

Bartholin gives an instance wherein the surface of both the cerebrum and cerebellum of an ox was converted into a substance as hard as stone. Stones have been found in the substance of the optic nerves ; the pineal gland is well known as a common seat of calcareous deposition*. Descartes imagined, as every one has read, that this gland was the seat of the soul: however, the case related in the Philosophical Transactions for 1686, in which this gland was found petrified in a distinguished literary character, was a death-blow to such an absurd hypothesis.

Up to the time of Scheele (1777) urinary calculi were universally regarded as a species of tartar. The discovery by this chemist of a new substance, the lithic or uric acid, in their composition, dissipated this idea, but gave rise in turn to the erroneous opinion that all urinary calculi were composed of it. Dr. Austin (1791) was the first to dispute the correctness of the new views ; but he adopted the not less exclusive, and equally unfounded notion, that calculi were universally composed of indurated mucus only. The progress of chemistry has now satisfactorily shown that urinary calculi vary considerably in their composition. They have been arranged under the following heads, viz. —1. Lithic acid calculi ; 2. Calculi of the Oxalate of lime, Mulberry calculi ; 3. Phosphate of lime

* De Graaf (De Succ. Pancr. p. 113) relates that he had seen stones in the pineal gland above twenty times, in persons who died both by natural and violent deaths.

do.; 4. Ammonio-phosphate of magnesia do.; 5. Fusible calculi or mixed phosphates; 6. Carbonate of lime do.; 7. Cystic oxide do.; 8. Xanthic oxide do.; 9. Alternating do.; 10. Fibrinous do*.

1. *Lithic acid calculi*.—The lithic acid calculus is by far the most common: at least two-thirds of the concretions found in the kidney and urinary bladder, owe their origin to the deposition of lithic acid, either in a pure state or combined with ammonia. Lithic acid is virtually insoluble in water, and it remains a problem still unanswered to say by what means it is voided dissolved in the urine. Healthy urine, again, contains lithate of ammonia to the amount of about 1-800th part, and as this salt requires about 480 times its weight of water to dissolve it, we see at once, that, if by any derangement in the digestive organs, the quantity of lithate of ammonia should be tripled in the urine, a portion of it would of necessity be thrown down, as the fluid would not be sufficient to hold the whole of the salt in solution: in this case, the lithate of ammonia would amount to 1.266th part of the urine; so that about three-eighths of it would be precipitated.

Calculi of lithic acid are found of all sizes, often of very large dimensions; those composed of

* For the following account of their chemical composition, I am mainly indebted to an article, by Dr. Thomson, of Glasgow, in the *Cyclopædia of Practical Medicine*.

lithate of ammonia are always small, and, unmixed with other deposites, seem nearly peculiar to children. They are undoubtedly to be ascribed to the existence of an excess of lithate of ammonia in the urine,—a very common consequence of indigestion, proceeding either from the use of an excessive quantity of food, or of food which does not agree with the constitution of the child.

2. *Oxalate of lime, or mulberry calculi.*—

Next to lithic acid, the oxalate of lime most frequently constitutes the nucleus of a urinary calculus. This calculus is usually of a dark colour, approaching to that of dried blood. Its surface is generally rough and tuberculated like a mulberry, whence its name; but there is one variety of it distinguished by the smoothness and polish of its surface, of a light bluish-grey colour, and which from these qualities is designated the *hemp-seed* calculus. The ordinary mulberry calculus is usually hard and compact: when cut through, it mostly exhibits an imperfectly laminated texture. Mulberry calculi are commonly of a spherical form, and do not often attain to very large dimensions.

3. *Phosphate of lime, or bone-earth calculus.*—

This calculus is described as being of a pale-brown colour, and having its surface smooth like porcelain, and highly polished, as very regular and laminated, the laminae being usually thick, and very easily separated from each other. It does not fuse before the blow-pipe. It dissolves readily in muriatic acid without effervescence, and is pre-

cipitated undecomposed by caustic ammonia. This calculus is extremely rare.

4. *Ammonio-magnesian phosphate, or triple phosphate calculi*.—These are always nearly white. The surface is slightly uneven, often covered with minute shining crystals, not smooth and polished. The texture is sometimes not at all, or very imperfectly, laminated; at other times, it is very regularly laminated. This calculus is in general soft, and easily broken and reduced to powder. But it is sometimes hard and compact, and when broken exhibits a crystallized texture, and appears somewhat transparent. In the Hunterian Museum, belonging to the University of Glasgow, there is a remarkable calculus of this kind. It was taken, after death, from the bladder, which it completely filled. It is an oval stone, constituting a pretty exact cast of this viscus*. Near the middle it is a little contracted, indicating in that place a stricture of the bladder. The length of this stone is five inches and a half. Its circumference where thickest, is fourteen inches and one-sixteenth; but at the stricture it is only ten inches. Its weight is one pound fourteen ounces and eight grains avoirdupois. It is white and crystallized on the surface. It is composed of a nucleus of lithic acid, having a brown colour, and of many

* There appears, indeed, to be no limit to the growth of certain calculi, as long as the receptacle in which they are contained is capable of further distension. Ruysch also narrates the case of a young man in whom a stone was found that filled the whole cavity of the bladder, but he mentions neither its dimensions nor weight.

concentric laminæ. The external crust is ammonio-phosphate of magnesia, mixed with some animal matter. Before the blow-pipe, this calculus gives off the odour of ammonia, and at length melts with difficulty. When treated with caustic potash, it gives out ammonia, and it is rapidly dissolved by very dilute acids.

Fusible calculi, or mixed phosphates.—This species is composed of the phosphate of lime, and the triple phosphate of magnesia and ammonia; is commonly whiter and more friable than any other species; and sometimes leaves a white dust on the fingers, like a mass of chalk. This calculus is usually not laminated. Occasionally, however, the mass readily separates into thin laminæ, the interstices of which are often studded with sparkling crystals of the triple phosphate. The variety of this species which is not laminated often acquires a very large size, and assumes the form of a friable white mass, evidently moulded to the contracted cavity of the bladder, or other part in which it has been formed. This species of calculus occurs very frequently; it readily melts before the blow-pipe, and hence the epithet—*fusible* calculus. It also dissolves readily in acids, and particularly in dilute muriatic acid; and if to the solution (not too acid) the oxalate of ammonia be added, the lime is precipitated alone; and the magnesia may be afterwards separated by the addition of pure ammonia. This calculus almost

always contains, besides the mixed phosphates, a little carbonate of lime and animal matters.

Carbonate of lime calculi.—In the lower animals*, these calculi are not very rare, though they are extremely uncommon in man. Mr. Smith describes some he had met with that bore a close resemblance to mulberry calculi, and yet consisted of carbonate of lime†. Dr. Prout mentions some small calculi which he had seen composed almost entirely of carbonate of lime: they were perfectly white and very friable.

The carbonate of lime calculus is easily detected from its property of dissolving in muriatic acid with effervescence; and the neutral solution is abundantly precipitated by oxalate of ammonia.

7. *Cystic oxide calculus.*—This calculus is of a yellowish white colour, and its surface exhibits a kind of crystallized appearance. It is not composed of distinct laminæ, but appears as one mass, confusedly crystallized throughout its substance. The fracture exhibits a peculiar glistening lustre, like that of a body having a high refractive density. When in small fragments, it is semi-transparent. This calculus is very rare, only seven or

* Urinary stones, often of very considerable size, are found not unfrequently in horses. Their composition differs considerably, according to the investigations of Fourcroy and Vauquelin, from the urinary calculi of the human subject; since they contain neither phosphoric nor lithic, but carbonic acid.—*Blumenbach's Comparative Anatomy*, by Lawrence and Coulson, 2d Edit. p. 132.

† Med.-Chirurg. Trans. xi. 14.

eight specimens having yet been recognised. When thrown on burning charcoal or treated by the blowpipe, it gives out a peculiar, very offensive, and characteristic odour. It is altogether a remarkable substance, and contains a large quantity of sulphur as an essential element. It is very easily dissolved either in acids or alkalies, and crystallizes from its solution in either.

8. *Xanthic oxide calculus*.—Of this very rare calculus only two or three examples have hitherto been observed. One was given to Dr. Marcet by Dr. Babington, who had it from one of his patients; but nothing farther is known respecting its history. It had an oblong spherical shape, and weighed about eight grains. Its texture was hard and laminated, its surface smooth, its colour cinnamon brown, much heightened by adding caustic alkali to the calculus in powder. Before the blowpipe, it split in pieces, turned black, and was consumed, leaving a minute particle of white ash. When distilled, it yielded a fetid ammoniacal liquid, from which carbonate of ammonia crystallized. When in fine powder, it was mostly soluble in boiling water, and the solution reddened vegetable blues. On cooling, the greatest part again subsided in white flocks. It dissolved in either acids or alkalies, though much more readily in the latter than the former. When its solution in nitric acid was evaporated to dryness, the residue had a bright yellowish colour. This residue was partly soluble in water, to which it

communicated its colour. Hence the reason of the name xanthic oxide, by which Dr. Marcet distinguished it. It was insoluble in alcohol, ether, and oxalic acid, and very sparingly soluble in acetic acid*. No portion of this calculus appears now to be extant. The second undoubted specimen of the xanthic oxide calculus known to exist, is in the collection of Professor Langenbeck of Gottingen, who extracted it by operation from the bladder of one of his patients. This calculus is larger than a pigeon's egg, smooth, and of a dark colour externally, regularly laminated, and of a dirty pink or salmon hue internally. I have seen a few fragments of this unique calculus in the possession of Dr. Willis, from an examination of which, and the published account of its analysis by Wöhler, the above particulars are given.

9. *Alternating calculus*.—This, as the name imports, may consist of different layers of any of the preceding kinds. Hence its appearance may be very varied. The nucleus is usually lithic acid or oxalate of lime; and the outermost crust is not unfrequently composed of triple phosphate.

10. *Fibrinous calculus*.—This calculus was sent to Dr. Marcet by Sir Astley Cooper. It was about the size of a pea, and had a yellowish-brown colour, somewhat resembling that of bees'-wax.

* Marcet's Essay on the Chemical History and Medical Treatment of Calculous Disorders, p. 95.

Its surface was uneven, but not rough to the touch,—its texture rather fibrous than stratified, and the fibres seemed to radiate from the centre. When heated, it took fire, swelled out, and burned like animal matter. It was insoluble in water and muriatic acid; but when boiled with caustic alkali, it formed a soapy solution, from which it was precipitated with difficulty. When boiled in very dilute acetic acid, it swelled to a great size, and was at last dissolved; and prussiate of potash, when added to the solution, threw down a yellowish precipitate. These characters lead to the conclusion, that the mass in question was no proper calculus, but a piece of fibrin, probably a clot of blood*.

“In the earlier stages of stone in the bladder, and before this viscus becomes secondarily affected, little is felt,” says Dr. Willis†, “beyond a dull sense of weight about the neck of the bladder, or an uneasiness referred to one or other of the parts connected with it, such as the hypogastric region, perinæum, or groin. In addition to this, the bladder generally shows itself more impatient of distension than usual; so that corresponding frequency of desire to make water is experienced, and the last drops of the fluid are scarcely expelled without the sense of weight and uneasiness increasing to actual pain, which then shoots along the perinæum, or seems to accumulate and centre

* Vide Marcet's Essay, &c., p. 101.

† Vide Dr. Willis on Urinary Diseases, p. 285 *et seq*

in the glans penis. Sometimes when the urine is flowing in a full stream, it is suddenly stopped, evidently owing to the foreign body in the bladder being carried by the current into contact with the inner orifice of the urethra, and there acting as a plug.

“Symptoms of stone in the bladder, however, though they may be slight at first, do not usually continue long without undergoing a change for the worse. The calls to make water, in particular, become more and more frequent, urgent, and distressing; nor is the act of voiding the bladder accomplished without a continually increasing amount of pain; the last drops are often expelled in agony, and their emission is succeeded by a kind of spasm or cramp of the bladder that endures, with but little remission, till there is another call to make water, and the torture has to be undergone again. Under these circumstances, patients grind their teeth, and with the last drop of urine, the contents of the rectum, of the mucous receptacles about the neck of the bladder, and I believe also of the vesiculæ seminales, are frequently expelled involuntarily, much to the distress of the patient, and with singular increase to his feelings of exhaustion. It is now that the urine is very regularly tinged with blood, and begins to contain a larger quantity of mucus than natural, which is deposited from it as it cools, intermixed with sedimentary matters of other kinds in the shape of a cloud. Hæmorrhage, to a very considerable extent, sometimes takes place

from the bladder, the urine being mixed with blood, in consequence of the mechanical irritation of the stone.

Children who labour under stone, cry, and even scream, at the time of passing their urine, or afterwards; they constantly apply their hand to the end of the penis, and elongate the prepuce in their attempt to deaden the painful sensation which they experience.

When a urinary vesical calculus has been formed for years, and has brought on severe symptoms, more especially if there be stricture of the urethra, or enlarged prostate gland, the kidneys, though before healthy, become involved; the severe dysury causes enlargement of the ureters from distension by the retained urine, and inflammation extends along them, even to the kidneys themselves. The pelvic cavities become altered in shape and enlarged, the infundibula extended or unfolded, and the lining membrane of the cavities thus acted upon, becomes thickened from repeated attacks of inflammation, and furnishes a catarrhal secretion. The parenchymatous substance of the kidney is next more or less absorbed; the mammary projections are obliterated; spurious hydatids occupy the cortical part; and all the most serious evils that belong to renal affections,—ulceration, contiguous abscess, or gangrene,—follow in the train of vesical calculus, and carry off the victim.

Persons affected with stone, and at the same time subject to gout, (which is by no means an

unfrequent coincidence,) require the greatest care as regards any operation proposed for their relief; for any increase of irritation may bring on an attack of gout, in which the bladder sometimes participates. It is in such cases as these that operations must be performed promptly, and that useless and long-continued manipulations are apt to prove most injurious.

Patients with diseased and enlarged prostate are said not to suffer more than others from stone in the bladder, probably in consequence of the tumor of the prostate preventing the stone falling down on the neck of the bladder.

When stone is suspected to exist in the bladder, the patient should be carefully sounded, and for this purpose he should be placed horizontally, either with his shoulders raised and in the half-sitting posture, or depressed greatly so that the pelvis is on the top of an inclined plane, and the axis of the spine forms an angle of about forty-five degrees with the plane of the horizon; the latter being the position best calculated to remove a stone, when it exists, from the neck of the bladder, and to carry it towards the fundus. If the patient has not emptied his bladder for an hour or two, the sound may at once be introduced. If the bladder has been emptied, or if there is a difficulty felt in exploring the cavity, then a sufficient quantity of tepid water should be injected through a catheter, with a properly adapted syringe or gum-elastic bottle. The silver catheter with a short and sudden

curve is sometimes used for sounding; but it is better to withdraw this if it has been used for the purpose of injecting the bladder, and substitute a solid steel sound of the same shape. The posterior part of the fundus can be better examined with a short beaked instrument than with the old-fashioned long-curved sound.

It occasionally happens that though calculi are contained in the bladder, it is difficult, if not impossible, to ascertain their existence during life; for the bladder may be sacculated, and then the sound affords no evidence of the presence of a solid body. For example, it is not rare to meet with an excavation immediately behind the prostate, or on one side of it, in which calculi of a moderate size easily escape detection by the sound. In persons far advanced in age, this secondary cavity, occupying the fundus of the bladder, bounded above by the prostate, behind by the orifices of the ureters, and the intervening portion of the parietes of the bladder, contains the stone firmly fixed in it; this state is generally accompanied with rather an extensive ulceration of the coats of the bladder. In other cases the stone is as it were pinched between two folds of the bladder; or it is fixed in a cul-de-sac, formed either by a hernia of the mucous membrane in consequence of a rupture of the muscular fibres, as so often happens in what are called columnar bladders (*vessies à colonnes*), or by a real cyst round the stone*.

* Velpeau's Médecine Opérative, 2d edit. 1839, tom. iv. p. 484.

LITHOTOMY.

In every case, before undertaking an operation for the removal of a vesical calculus, besides searching the bladder itself with a sound, the surgeon ought to make an examination with the finger in ano.

Contemplating the performance of lithotomy or lithotritry, the surgeon should be extremely particular in preparing his patient for the operation : in fact, the most successful lithotomists are those who are most attentive to this point. If the patient's health is much impaired, and the bowels are relaxed, which is not unfrequently the case in children, or if the urine is alkaline, we must, before the operation, lessen the irritability of the bladder and bowels by an anodyne, and improve the patient's health, as far as we can, by medicine and attention to diet. I generally give, on the night preceding the operation, a few grains of hydrag. c. creta, with the pulv. rhei, and, early on the following morning, some castor oil. Two clysters should be given before the operation ; one, two or three hours after the oil, composed of gruel, olive oil, and salt ; and the other about an hour before the operation, made with common gruel and twenty or thirty drops of laudanum. If the last injection has not come away, when the surgeon arrives to perform the operation, he should urge the patient, if an adult, to go to stool : if a child, it will generally happen that the injection, if it has not passed off, will do so at the time the staff is intro-

duced. On no account should the surgeon undertake the operation till the injection has come away.

There are three different spots at which the bladder may be opened for extracting calculi: the first is at its anterior and superior surface, above the pubes; the second at its inferior, anterior, and lateral part, through the perineum; and the last at its inferior and posterior part, by the rectum.

In order to perform the high operation, or that above the pubes, it is necessary that the bladder should rise above the superior edge of the pubes, which it does not reach when empty: hence, it is necessary to begin by distending the bladder with injections, or waiting till sufficient urine has accumulated to produce the desired effect, or by elevating the anterior and superior part by means of a sound, the point of which must be made to glide from below upwards, against the posterior surface of the pubes. The external incision must be made vertically on the median line of the body, immediately above the pubes, and about two inches in length. The linea alba must then be divided, taking care not to open the peritoneal cavity. The surgeon then goes on to make an opening of about two or three lines immediately above the pubes, in the spot which corresponds to the space filled with fatty cellular tissue, and bounded inferiorly and posteriorly by the peritoneum, which is reflected on the wall of the abdomen only at a certain distance above this long arch. A grooved

director is then introduced between the aponeurosis and peritoneum, which serves to guide the knife in the division of the linea alba. Lastly, the operator endeavours with his finger to feel the extremity of the sound previously introduced into the bladder, and then divides the anterior wall of that organ.

This method of operating is now nearly abandoned in Great Britain, though it is still practised in France, and, judging from its results in the hands of M. Souberbielle, with a very fair amount of success in the worst description of cases, those viz. in which the stone is of large size. M. Souberbielle is indeed a great advocate for the high operation; and in a memoir presented to the Royal Academy of Medicine in 1835 and since published, gives the particulars of 50 operations by this method.

Ages.			Number of Cases.	Cured.	Died.	Ratio of Mortality.
Under	10		9			
11	to	40	3			
40	to	50	1			
51	to	60	5	39	11	1 in $4\frac{1}{2}$
61	to	70	13			nearly.
71	to	80	17			
80	& upwards.		2			

Up to the age of 22 no patient was lost. The mortality of 11 has therefore to be divided among about 40 subjects, which brings it to 1 in $3\frac{2}{3}$ ds. nearly. Many of M. Souberbielle's cases were unfavourable; in three the stone weighed 4 ounces, and in two it weighed 5 ounces; six of the patients

moreover had already submitted to lithotomy, and twelve had had attempts made to grind or crush their stone.

In performing the lateral operation for stone, or that in which the bladder is reached in its anterior, inferior, and lateral aspect, through the perineum, the patient should be placed on a table of such a height, that the perineum shall be opposite to the breast of the surgeon. The table should be rather a little too high than too low, for it will be an advantage in the operation to be a little under the work rather than above it. After the patient is bound, his shoulders and back should be raised and supported with pillows; he should also be brought to the edge of the table, and his thighs kept widely separated by assistants; but it is of great importance that the nates be kept straight, and that an inclination be not given to one side more than the other.

In the mode of proceeding usually followed, the surgeon begins the incision of the integuments on the left side of the raphé, about an inch in front of the anus, and terminates it between this opening and the tuber ischii. The fatty cellular layer comprised between the left erector penis and accelerator urinæ, as well as the fibres of the transversi perinei muscles, are then divided, and the membranous portion of the urethra is incised; the groove of the staff is thus exposed, and a probe-pointed knife, a bistouri cachée, or a gorget, is conveyed along the groove until it reaches the bladder,

dividing in its course the thin fibres of the levator ani, the lateral portion of the prostate gland, and in some instances a part even of the neck of the bladder. The cutting instrument is then withdrawn, and the left fore-finger is introduced; the staff being next withdrawn, the forceps are conveyed along the finger, and the stone is seized and extracted.

In order to avoid with greater certainty, the spongy portion of the urethra, some surgeons advise the operator to push the internal lip of the wound inwards, with the fore-finger of the left hand, and to cut on the nail of that finger. A division of the trunk of the internal pudic artery would be a much more serious occurrence than a wound of the bulb; but the vessel is very rarely cut, for, to reach it, the incision must be extended downwards and outwards, even as far as the bony parts of the pelvis, against which the artery rests. On the other hand, if, to avoid this accident, the operator does not carry the incision with sufficient obliquity outwards, he runs the risk of wounding the rectum. The direction which ought to be given to the incision of the prostate, and its extent, are also points of the greatest importance to the success of the operation. Cheselden is supposed to have divided in his operation as little as possible of the prostate gland.

The first account* we have of Cheselden's operation, is in his Appendix to the fourth edition of the *Anatomy of the Human Body*, which

* Willis on Treatment of Stone, p. 182.

appeared in the year 1730. In this Appendix, after describing the first stage of the operation, he goes on to say : " I then feel for the staff, and cut upon it the length of the prostate gland straight on to the bladder, holding down the gut all the while," &c. &c. In the Appendix to the fifth edition of the Anatomy, which issued ten years later, viz. in 1740, the description is the same till we pass the words " I then feel for the staff," when he proceeds, " holding down the gut all the while with one or two fingers of my left hand, and cut upon it in that part of the urethra which lies beyond the corpora cavernosa urethræ, and in the prostate gland, cutting from below upwards to avoid wounding the gut." Dr. Yelloly, in a learned and very able paper published in the 15th volume of the Medico-Chirurgical Transactions, (Lond. 1829,) speaks of these two operations as identical. If the words in which they are described be taken in their most simple signification, however, it seems to me that the two operations are totally different. In the one, the first, the prostate is cut in its length, and the knife in the groove of the staff is passed into the bladder ; in the other, the second and improved operation, the knife is entered through the distal edge of the prostate only, and the membranous part of the urethra is slit open. The first method is the lateral method of English surgeons of the present day ; the second method has scarcely if it has ever been intentionally performed since Cheselden himself ceased to operate : nevertheless, that it was the

one which he approved, there can be no doubt ; for it is that along with which his most brilliant successes were achieved, and it is that which is found in the next and only other edition of the Anatomy which appeared during his lifetime, the sixth, which issued in 1750.

Mr. Martineau, one of the most successful lithotomists of modern times, divided only a part of the prostate gland ; Mr. Crosse *, who witnessed for many years Mr. Martineau's public practice, says, (p. 156,) that "he, (Mr. M.) seldom if ever divided the prostate gland through its entire depth, is the opinion I have formed from observation of many operations by him, and which is supported by the only dissection I had the opportunity of making ; still, enough was cut to allow the blunt gorget to enter the bladder, and then the operator invariably adopted a proceeding which forms no unimportant part of the operation : the staff withdrawn, he was accustomed to introduce his left fore-finger (which was particularly long and large) upon the concavity of the gorget, into the bladder, forcibly dilating the opening, and using the finger as a powerful but safe instrument for rendering the neck of the bladder ample to admit the forceps. The force and determination with which the finger was thus used, dilating, if not lacerating, the remaining undivided portion of the prostate gland and the neck of the bladder, I always regarded as a peculiar and intrin-

* On the Formation, Constituents, and Extraction of the Urinary Calculus, by John Green Crosse, 4to, London, 1835.

sis part of Mr. Martineau's method of operating. The opening into the bladder being thus effected, partly by cutting and partly by dilating, the forceps usually entered readily, and in the use of these, rapidly carrying them to different parts of the bladder if required, or more frequently seizing at once the stone (previously felt and its situation ascertained by the finger), Mr. Martineau possessed a degree of freedom and dexterity unparalleled within my observation, and surpassed most surely by very few amongst those who have become conspicuous in this branch of operative surgery."

The following is the plan of operating which I adopt:—I introduce a curved staff, and give it to the care of an assistant, directing the handle to be inclined a little towards the ground, and the groove to be turned towards the left side. By this inclination of the handle, the groove of the staff is certainly made less prominent in the perineum; but there is this advantage attending it, that when we have cut into the groove, there is no occasion to alter the position of the staff, and the fore-finger of the left hand is quite at our disposal for protecting the rectum, and guiding the knife. I find that I can perform the operation much more rapidly in this way, than by taking the staff into my own hand. M. Langenbeck is a strong advocate for this mode of holding the staff; he, however, advises the handle to be inclined still more towards the ground than I do. I begin the first incision rather low, about

two fingers' breadth above the anus : the bulb of the urethra will then be avoided. In fact, the external incision, if commenced higher, can be of no use to the operator ; and I find that this, the upper part of the wound, is often the slowest to heal. For the division of the prostate, I use the long straight knife, with the beak in the middle line of the point ; and I feel confident that it is the safest and best instrument that can be employed.

In the transverse or bilateral operation, which may be viewed as a modification of the lateral operation, and was highly vaunted by Dupuytren, the surgeon makes a semi-lunar incision, the centre of which is situated in front of the rectum, behind the bulb, and the extremities of which are turned outwards and backwards towards the tuberosities of the ischia. The membranous portion of the urethra is then opened, and the incision extended from right to left in the substance of the prostate, so as to form a triangular flap, which contains the vasa efferentia and verumontanum, and the inferior half of the prostatic portion of the urethra. By this means an opening much larger than that procured by the lateral operation is obtained, and the injury of the ducts is more certainly avoided ; while there is no hæmorrhage of importance to be dreaded.

The recto-vesical operation is performed by dividing the external sphincter of the anus, and inferior portion of the rectum, on the median line,

and in the direction of the raphé; the inferior surface of the prostate will be exposed, rendering it easy to separate with the finger the intestine from the bladder, and open the bottom of this viscus, or the prostatic portion of the urethra, on the median line, and penetrate into the bladder by its neck. By following the first mode, the operator must take great care not to extend his incision of the bladder more than two inches beyond the edge of the prostate; for, by so doing, he would run the risk of dividing the fold of peritoneum, situated between the superior part of the bladder and the rectum. On the other hand, if the incision be not made on the median line, he would wound the vasa deferentia, or the vas efferens, an occurrence which would cause the atrophy of the corresponding testicle.

It is scarcely possible to say too much as to the caution necessary in the extraction of a large stone. We are to draw out the stone gradually, endeavouring to dilate the parts through which it is to pass, instead of tearing them; and it is astonishing to what an extent this gradual dilation may be accomplished in the hands of a prudent surgeon.

A source of difficulty* not unfrequently arises to prevent the seizure of the stone and its extraction, from the forcible contraction of the bladder upon it, which the introduction of the forceps and attempts to find the stone tend to provoke. This

* Mr. Lee on Lithotomy and Lithotrity, page 19.

impediment sometimes prolongs the operation considerably, and even occasionally prevents its completion; the danger being increased in proportion to the length of time occupied in the attempts, the patient becoming exhausted; and the parietes of the bladder bruised, and perhaps pinched or lacerated by the forceps. In these cases, by waiting a little while, the contractions of the bladder will often cease, and admit of the removal of the stone with facility; whereas, on the other hand, the repeated introduction of instruments, and the fruitless trials to seize the stone, when the surgeon is anxious to perform the operation quickly without due regard to the difficulties he may encounter, will, in many cases, excite still more the contractibility of the bladder, and thus prevent the desired object. Mr. Crosse mentions, in his work, a case where three-quarters of an hour were uselessly employed in attempts with the forceps to find a stone, of the size of a pigeon's egg, which came out of itself, some time after they had been discontinued.

This difficulty is sometimes experienced with respect to a small stone, upon which the bladder partially contracts, and which it encloses as in a cyst.

If any hæmorrhage occur, we must endeavour to compress the bleeding vessel with the finger. It is always a most untoward circumstance when it happens, though it is rare that patients die immediately from loss of blood. The arteries

that necessarily lie in the way of the knife are not large enough to afford a hæmorrhage sufficiently rapid to induce fatal syncope; but the draining sometimes continues for hours, either backward, into the bladder, or slowly by the external wound, and gradually exhausts the powers of the patient.

If no inflammatory symptoms ensue, the after treatment consists in merely keeping the patient quiet; though, with children, it is extremely difficult to carry this into execution. The knees, by some surgeons, are tied together, by others they are not; but they should always be kept raised, and the scrotum supported. No application is required to the wound; but the urine should be received on sponges, and the parts kept clean and dry. Some urine soon begins to flow through the natural passage. In a man above sixty, on whom I operated some time ago, a considerable quantity of water came through the urethra on the morning following the operation. The time, however, varies at which the water entirely ceases to pass through the wound; and, in some rare cases, urinary fistulæ remain.

In estimating the risks from lithotomy (says Dr. Willis*), age is an essential element in the reckoning. The operation, previously to puberty, is a very different affair from what it is after this period.

* On the Treatment of Stone in the Bladder by Medical and Mechanical Means, by R. Willis, M.D., p. 158, *et passim*. This work contains a greater amount of statistical information on the operation for Stone, than any other with which I am acquainted.

Very little information is, in fact, to be gained from statements of the results of the operation for all ages and sexes. It would seem generally to be of little moment who was the surgeon and what the operation; if the majority of subjects be youthful, the success will be considerable, the mortality may be no more than 1 in 20 or 25; if, on the contrary, the majority of the patients be adult and aged, the mortality will certainly be from 1 in 5 to 1 in 2, according to the period of life*.

The influence which the size of the calculus taken out in lithotomy has upon the mortality after the operation, is a point which has only been touched upon very generally. It is familiarly known, indeed, that the extraction of a very large stone is almost certain destruction to the patient; but we have scarcely any data from which we can deduce the relative influence on the event exerted by stones of different sizes. Mr. Crosse is almost the only writer who has seen this subject as one of interest and importance, or who has had materials at his disposal, from which other than either purely individual or extremely general inferences could be drawn. From the invaluable Norwich data, Mr. Crosse† has presented us with the following table of 704 calculi, arranged according to the weight, with the result of the operations performed for their removal severally.

* The oldest patient on whom I have operated for Stone was seventy-seven years of age.

† Op. cit. p. 162.

Weight.	Number of Cases.	Cured.	Died.	Ratio of Mortality.
1 oz. and under.	529	482	47	1 in $11\frac{1}{3}$ nearly.
1 to 2 oz.	119	101	18	1 in $6\frac{2}{3}$ —
2 to 3 oz.	35	19	16	1 in $2\frac{1}{5}$ —
3 to 4 oz.	11	4	7	1 in $1\frac{4}{7}$
4 to 5 oz.	5	2	3	1 in $1\frac{2}{5}$
5 to 6 oz. }	4	2	2	1 in 2
6 to 7 oz. }				

This table is valuable, and the information it conveys extremely important. With a stone one ounce in weight and under, it is obvious that the chances of a favourable issue are nearly twice as great as with a stone between one and two ounces in weight, and nearly six times as great as when the stone weighs between two and three ounces. The mortality with stones of every weight over an ounce is 1 in $3\frac{3}{4}$ ths nearly; and with those over two ounces it is something more than 1 in 2. Of the 55 instances in which the stone weighed two ounces and upwards, 27 recovered and 28 died. The chance which a patient has for recovery after lithotomy can therefore be calculated beforehand, and independent of every other consideration, from the ascertained dimensions or weight of his stone. Doubtless, some considerable portion of the greater comparative success that attends lithotomy in early life is due to the generally smaller size of the stones that are then extracted. So far as my observation goes, I should say that the majority of stones taken from the

bladders of adults and aged individuals exceeded an ounce in weight.

A certain moderate size of stone, however, would seem rather to be advantageous than otherwise; the most favourable results are not associated with the smallest stones, as is apparent from the particulars conveyed by this table, from Mr. Crosse, of the 529 calculi of the preceding table that weighed 1 oz. and under :

Weight.	Number of Cases.	Cured.	Died.	Ratio of Mortality.
1 dr. and under.	134	122	12	1 in $11\frac{1}{6}$
1 to 2 drs.	111	101	10	1 in $11\frac{1}{10}$
2 to 3 drs.	95	90	5	1 in 19
3 to 4 drs.	68	60	8	1 in 8
4 to 5 drs.	29	28	1	1 in 29
5 to 6 drs.	38	35	3	1 in $12\frac{2}{3}$
6 to 7 drs.	24	21	3	1 in 8
7 to 8 drs.	30	25	5	1 in 6
Total	529	482	47	1 in $11\frac{1}{3}$ nearly.

With stones under two drachms in weight the mortality is therefore greater than with those that are between two and three drachms, and particularly with those between four and five drachms: the chances of recovery with this last weight of stone are actually about two and a half times greater than with a stone that weighs less than a drachm. A certain moderate size in the calculus is therefore an advantage, I believe, because stretching is brought to the aid of cutting. Near and after the

ounce weight, tearing is added to stretching, and immediately the mortality rises.

Measurements of calculi would be far more important elements in forming estimates of this kind than weights; it is the size of the stone that determines the extent of outlet necessary to give it passage, and this extent of outlet it is that influences the mortality: large stones often weigh very little; small ones, again, are frequently remarkably solid and heavy.

Inflammation and suppuration of the cellular tissue surrounding the bladder, are almost invariably found after fatal operations for lithotomy, attended with the symptoms which have been already described in Chapter VIII.

In many, or perhaps most, of the fatal cases of lithotomy, inflammation of the peritoneum investing the fundus of the bladder, is also found to exist to a greater or less extent.

But Mr. Crosse, whose experience is very large, says*, "that as a separate malady, unaccompanied by urinary infiltration and diffuse reticular inflammation, peritonitis is, according to my experience, not frequent; it is known by the usual signs, and commences in the vicinity of the bladder, where the pain is first felt, spreading thence over the rest of the peritoneal surfaces; the most active antiphlogistic treatment, by bleeding, low diet, fomentation, and counter-irritation, are required, and, if promptly and early practised, will

* Op. cit. p. 82.

arrest the disease. In children, who are rarely sufferers from diffuse reticular inflammation and urinary infiltration, peritonitis occurs, and yields to active treatment, particularly leeching freely the abdomen ; but in the aged, urinary infiltration and reticular inflammation and suppuration are frequent in comparison with unmixed peritonitis : the surgeon seldom has to treat the latter, and when the combined diseased action is present, I must repeat that general bleeding and purging sink the powers without arresting the malady, and should be very guardedly undertaken by the surgeon.

“Patients die after litho-cystotomy, from nervous exhaustion, unconnected with loss of blood, or with any of the preceding morbid conditions. A tympanitic state of abdomen, with a feeble and easily-compressed pulse, supervenes in adults, particularly in the aged, a few days after the operation, unaccompanied by pain or the signs of peritonitis. Opiates are indicated, with good nutriment sometimes administered by lavement, where the stomach is disinclined to receive it ; and even stimulants are required, but bleed and blister in such a case, or omit to supply nutriment and stimulus, and the patient will have no chance of living. Danger is always to be apprehended, when such symptoms of nervous debility arise ; but I have known recovery from the treatment recommended, where the abdomen was tympanitically distended, the pulse intermitting, and a troublesome hiccough present for several days.”

LITHOTRITY AND LITHOTRIPSY.

OF late years, an operation for destroying stone in the bladder, lithotrity or lithotripsy*, has been much practised; and in many cases it is more applicable to the patient's condition than lithotomy. As every surgeon who undertakes the management of calculous patients ought to make himself master of this new branch of surgical practice, I have thought it advisable to give a summary account of the mode of operating. In one mode of proceeding, the patient is placed on what is termed a rectangular bed, which is not unlike the common operation-table. It is, however, rather shorter; and the two legs which support the head and upper part of the body being attached with hinges, they admit of being folded under, and so of depressing the head and shoulders of the patient, and consequently the fundus of the bladder, to any degree. The shoulders of the patient are supported by a wedge-shaped box, which prevents the situation being rendered painful by the dependence of the head. The receding of the patient is prevented by a leather strap passed round the shoulders, and buckled to the sides of the bed, and the feet are secured in slippers attached to the foot. The object of the inventor of this machine, Baron Heurteloup, was to raise the pelvis to such a degree, that stones situated

* Lithotrity is derived from λίθος, a stone, and τερέω, to pierce; lithotripsy, from λίθος, and τριβω, to triturate or pulverise.

behind the neck of the bladder, in the horizontal posture of the patient, might be thrown back, and with greater facility seized. Another object proposed by this invention, is the supplying a fixed point for the instrument with which the stone is to be attacked, during the process of comminution : this is fulfilled perfectly by a curved bar of iron which is attached by a screw to the foot of the bed. Most English surgeons, however, dispense with this bed, and place the patient on his back on a sofa or couch, with the pelvis supported by a thick cushion, so that it may be higher than the shoulders.

The instrument commonly used in this country for performing the operation of lithotripsy, is composed of two pieces of steel, one sliding longitudinally within a groove of the other. The extremity which enters the bladder is curved, but not in the manner of a common catheter ; the curve being more abrupt, and the curved part considerably shorter. When the forceps are to be opened, the sliding piece is drawn towards the handle of the instrument, and thus the blades, in being separated, are still kept parallel to each other. They are closed by an opposite movement, effected by turning a screw forwards. For the construction and invention of these instruments, we are indebted to the perseverance and skill of Mr. Weiss of the Strand.

The original idea of curved instruments to act upon urinary calculi is no doubt due to Mr. El-derton, whose instrument is described in the

Edinburgh Medical Journal for 1819. This was intended for the purpose of seizing the stone and filing it away, by a file passed along the stem of the instrument. Mr. Weiss' forceps for the extraction of calculi through the urethra, though not to be ranked among the lithotritic instruments, was of somewhat similar form, and was used for the first time on a patient by Sir A. Cooper in 1820. Four years later, a curved instrument, not very unlike the lithotrite of the present day, was constructed by Mr. Weiss. An important improvement has been effected within the last three or four years by Mr. Weiss, at the suggestion of Mr. Oldham, by which a serious inconvenience formerly attending the use of the lithotrite is obviated. This consists of an opening being made in the curved portion of the convex branch, which, without weakening the instrument, allows of the detritus being pressed through, as the stone is crushed, instead of becoming collected between and clogging the branches,—thus impeding their closure and the consequent withdrawal of the instrument, which not unfrequently occurred before the improvement was made. For extracting the fragments and crushing small stones, the screw-scoop is to be used instead of the lithotrite.

The following engravings exhibit the screw lithotrite and screw scoop.

Fig. 1.

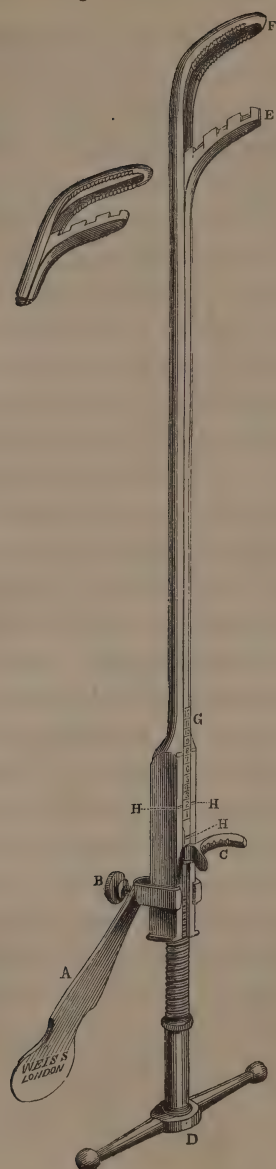


Fig. 2.

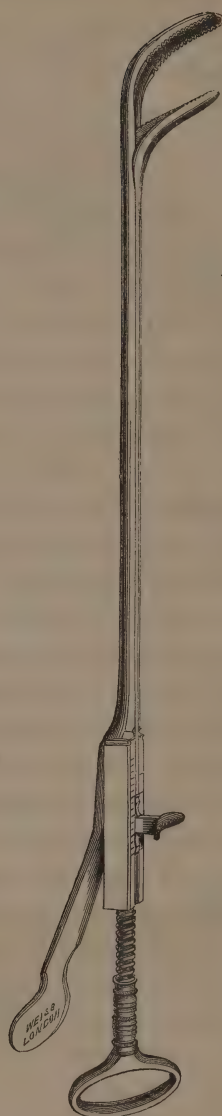


FIG. I. *The Screw Lithotrite with the blades open to receive the Stone.*

- A. The handle, which may be shifted at pleasure backwards or forwards, to accommodate the instrument to the hand of the operator, or it may be removed altogether, while sounding with the instrument.
- B. A small screw for fixing the handle, A.
- C. The Thumb piece, by which the inner blade is moved backwards or forwards independent of the screw.
- D. The screw, which being turned to the right forces the inner upon the outer blade, and thus crushes a stone, caught between the blades.
- E. The inner or moveable blade, accurately fitted to
- F. The outer or fixed blade.
- G. The graduated scale, indicating the size of the stone when seized, or the distance the blades of the instrument are separated.
- H. H. H. Deep hollows or marks made in both blades of the instrument to form an index; as when the hollows on the instrument and the hollow on the moveable blade form one line, the instrument is quite closed; and the number on the moveable blade when in a line with the hollow on the outer blade, indicates the distance the two blades are separated at the point.

FIG. II. *The Screw Scoop.*

This instrument has a flat handle like a sound, for the greater facility in its management. The blades are made hollow, for the purpose of collecting and retaining the fragments, and are sufficiently strong to break such fragments, or small calculi.

The patient having been placed on a common couch, with the pelvis raised, the bladder is to be injected with five or six ounces of lukewarm water; and if any considerable quantity of the water escape, the injection should be repeated, as it is absolutely necessary that the operation should

never be attempted on an empty bladder. Resistance is sometimes experienced to the injection of water, in consequence of the end of the catheter not being fully introduced into the bladder, the eyes of the instrument being obstructed by the side of a large prostate gland. The force required to overcome this obstruction is considerable, and occasions the patient great pain.

The lithotrite is next to be introduced ; and is first to be used as a sound, so as to ascertain the exact situation of the calculus. The lithotrite or stone-forceps is then to be cautiously opened over the stone, and afterwards closed upon it, the force necessary to pulverise the stone being obtained by turning the screw forwards. By this simple management, with a light hand, the stone is seized with facility in the great majority of cases. Otherwise we may succeed by the following method, which is especially adapted to those cases in which the bladder contains several stones of very small size:—Let the forceps be opened, with the convexity of its blades pressed against that part of the bladder which is towards the rectum, so as to make it the lowest or most depending situation : then, by a slight motion given to the handle of the instrument, the stones are made to roll into its grasp. The directions which Sir B. Brodie* gives on this part of the operation are extremely useful:—“ Raise the handle of the forceps, so as to bring the convexity of the fixed blade in contact

* Lectures on the Urinary Organs, third edition, p. 364.

with the posterior part of the bladder ; then open the moveable blade, at the same time making a moderate pressure downwards, in such a manner as to depress the bladder towards the rectum. The instrument being then gently shaken by a lateral motion of the hand, the calculus, in whatever part of the bladder it may be situated, will roll between the blades, and will be seized by closing them. Having been thus carefully secured, by turning the screw it is broken into fragments. The whole of this is a very simple process, requiring but little practice to make you a perfect master of it. When the calculus has been once broken, the fragments are to be seized and crushed in the same manner. They will fall one after another into the grasp of the forceps ; and there is no limit to the number that may be crushed at one time, except what is afforded by the diameter of the urethra. Every fragment that is crushed adds to the accumulation of calculous matter ; and if the accumulation be very large, it becomes difficult, or impossible, to withdraw the instrument without injury to the membrane of that canal. The marks on the handle of the instrument inform you of the exact extent to which the blades are separated ; and you must use your own discretion, founded on your knowledge of the size of the urethra, as to the point at which you should stop. The forceps first used being then withdrawn, you may use a second, and even a third, in the same manner ; and thus you may not only crush a great number of frag-

ments at one operation, but you may remove from the bladder a great deal of what has been crushed."

The fragments of the calculus may be seized several times during one sitting. When the bladder is not irritable, the seizure of the fragments may be repeated from five to eight times, and a large part of the stone reduced to a state fit for expulsion. In repeating the attacks upon the stone at the first sitting, the sensations of the patient become the surgeon's best guide. Before the instrument is withdrawn, or even closed, it should be moved from its situation, to ascertain that no portion of the prostate is entangled between the blades: it is then to be closed, and withdrawn. In a minute or two the patient voids the water which had been injected, and some sand or small particles of the stone; the larger portion remaining behind to be expelled by the bladder, which by degrees recovers its tone, and is then excited to contract with effect. The sand and smaller particles are voided first from the bladder; and then, by a more powerful action of the organ, the larger pieces are expelled. Three or four days are usually sufficient for the expulsion of the whole of the fragments. Before another sitting takes place, sufficient time should always be allowed for the escape of the fragments, and the subsidence of the inflammation.

Mr. Lee enumerates the following occurrences as occasionally supervening on the operation of lithotritry: "retention of urine, either from the irri-

tation caused by the arrest of fragments in the urethra; from this passage being obstructed by coagulated blood; from spasmodic action at the neck of the bladder; from atony of the bladder, or enlargement of the prostate gland; but it mostly admits of being removed by the catheter, or by the employment of antiphlogistic and sedative remedies.

“A high degree of irritability of the bladder, marked by frequent desire to make water, increase of the pain, and other symptoms, is occasionally induced by lithotrity. This may go on to inflammation, attended with great constitutional irritation, and a copious secretion of mucus, and is most likely to occur in young subjects, or in those of an irritable habit, where the sittings have been too much lengthened, or where the stone is exceedingly hard or of large size, requiring many sittings for its removal. The presence of sharp angular fragments of certain kinds of calculi is also a cause of cystitis in some cases.

“Cystitis is the most formidable accident to which lithotrity can give rise, and the most likely to prove fatal. A degree of chronic inflammation, however, accompanied with discharge of mucus, but without pain or much constitutional disturbance, is not unfrequently induced; this subsides after a short time by repose, and the use of appropriate remedies. In some cases where a state of chronic inflammation, with copious secretion of mucus, had previously existed, the discharge has dimi-

nished and the inflammation subsided during the treatment, by means of lithotrity, probably in consequence of the bulk of the foreign body being lessened; but whatever be the cause, experience has shown that this result not unfrequently occurs."

Although lithotrity is often very easily performed, it is necessary that the patient's health should be brought into a favourable condition for the operation; the same care should be taken for a few days at least both before and after it as in other important operations. It has been too much the custom of late years to regard the operation of lithotrity as a light one, and to pay but little attention to the subsequent management of the patient. In one case in which I operated, the patient rode in a jolting vehicle from my house to Wandsworth, the consequence of which and of the operation (though it was performed without difficulty) was an attack of fever which confined the patient for some weeks. In another case, considerable hæmorrhage followed, which I attributed more to the exertion afterwards than to the operation itself. I have come, therefore, to the determination not to perform the operation of lithotrity except at the patient's house, and to keep him quiet for several days after each operation.

The state of the prostate has great influence on the degree of facility with which lithotripsy may be performed. This gland is situated chiefly under the neck of the bladder, which it sometimes

completely envelops, forming a kind of furrow, in which the commencement of the urethra and the neck of the bladder are lodged. It is evident that the difference in the size and form of this gland will have especial influence on the canal with which it is so closely connected. The state of this gland ought then to be particularly examined, when considering the propriety of performing lithotripsy.

A simple mucous catarrh of the bladder is not a valid objection to the operation of lithotripsy; but when the discharge is muco-purulent, and attended with an hæmorrhagic disposition, the operation ought not to be undertaken.

Another cause which renders lithotripsy difficult, is the great degree of contractility which the bladder manifests in some subjects; and this whether the organ be at the same time extremely sensitive, or whether, on the contrary, the sensibility exists only in a slight degree. Although the parts are healthy, a small stone, not long formed, in such cases induces a state of spasm and contraction, which renders the operation either extremely painful, or impossible at the moment. The first measure in these circumstances is therefore to reduce the state of exaggerated sensibility by appropriate treatment—rest, gentle aperients, anodyne glysters, &c., and then to proceed to the operation.

No data exist in this country from which we can draw a conclusion as to the results of lithotripsy on an extensive scale. M. Velpeau has published

an analysis of the cases of M. Civiale, the most experienced lithotritist of the present day, which are arranged in five series.

Series.	Number of Cases.	Cured.	Dead.	Unrelieved, the stone remaining.	Otherwise, Success in	Failure in
1st.	83	41	39	3	41	42
2nd.	24	13	11	0	13	11
3rd.	53	30	15	8	30	23
4th.	30	18	8	4	18	12
5th.	16	6	7	3	6	10
	206	108	80	18	108	98

That is to say, of 206 patients operated upon, 108 (a very little more than one in two) recover immediately; 80, or nearly one in two and a half, die; and 18 retain the stone, and will be lost:—108 cases cured, to 98 in which death is immediately induced or may not be averted within a brief interval of time.

After reviewing the circumstances connected both with lithotomy and lithotritry with great impartiality and judgment, Mr. Lee draws the following conclusions:

1stly. That lithotomy is still, in the present state of the art, the operation most suited to the majority of cases of stone in the bladder, inasmuch as about one-half of the number of stone patients consists of children, to whom, with a few exceptions, it is more particularly adapted.

2dly. That, as far as adults and elderly per-

sons are concerned, lithotrity is most applicable to an equal, if not to the greater number of cases.

3dly. Lithotrity is preferable in the great majority of female patients.

4thly. Other circumstances being favourable, lithotrity is more especially suited to calculi of small size, even when hard.

5thly. Lithotrity is less applicable than lithotomy to most cases, where the bladder contains several calculi, especially if they be hard.

6thly. Lithotomy is the preferable, and often the only admissible operation, in cases of large calculi ; as also in those cases where the stone, though only of moderate size, is yet of considerable density, and irregular on its surface, as in the oxalate of lime variety.

7thly. When there exists much irritability of the urethra and bladder, which cannot be allayed by preparatory treatment, lithotomy would be the preferable operation ; especially if the irritability appeared to be chiefly dependent upon the presence of the stone.

8thly. Lithotrity is applicable in some cases of deranged health, or disease of parts, which would contraindicate lithotomy, or would render its performance most likely to be attended with failure.

9thly. The degree of pain from the performance of lithotrity is not great in many cases, and is mostly diminished after the first sittings ; but, on the other hand, in some instances, the operation is

very painful, and the pain becomes increased in subsequent sittings; though, perhaps, never so acute in lithotritry as in lithotomy, yet as the pain in the latter operation lasts only for a few minutes, whereas in the former it recurs, though less in degree, on each sitting, the patient frequently suffers by lithotritry a greater amount of pain.

10thly. The duration of the treatment is generally longer by lithotritry than by lithotomy, though sometimes it is shorter; and after the stone has been removed by the latter operation, the patient, though confined to his bed, may, during the greatest part of the period, be considered as convalescent; whereas, when lithotritry is performed, there is always a risk, so long as any fragments remain in the bladder, of circumstances arising to prevent the completion of the operation, and the patient cannot be regarded as out of danger.

11thly. When lithotritry is applicable, the method by pressure is, in the great majority of cases, infinitely superior to that by percussion.

12thly. Lithotritry exposes more to the risk of a relapse than lithotomy, on account of the great probability of a portion of stone having escaped detection, and remaining in the bladder after the operation.

In females stone is not of frequent occurrence. Owing to their more regular habits, urinary calculi are seldom formed, and when they do exist, in consequence of the shortness and dilatibility of the urethra they are easily passed. Cases of cal-

culi, however, occasionally occur, which require surgical interference for their removal. The most simple mode is to dilate the urethra with Weiss' dilator, so as to allow of the introduction of a forceps into the bladder, and the extraction of the stone. The dilatation of the urethra will be materially facilitated by a small incision being made in the external meatus in the direction upwards towards the pubes; by a slight division of this kind, the urethra will easily admit of dilatation to a considerable extent. If the calculus be so large as not to admit of being extracted through the urethra, then it should be broken by means of the screw lithotrite and the comminuted fragments afterwards removed by the scoop. Incontinence of urine is the chief inconvenience which follows the dilatation of the urethra, therefore the dilatation should not be carried further than is absolutely necessary for the removal of the stone.

Few cases are likely to occur in which a stone may not be removed from the female bladder by the above methods. If the stone cannot be extracted by these means, then recourse must be had to the knife, and the operation may be performed in the following manner. A straight staff, or director, is to be introduced through the meatus urinarius, with the groove turned obliquely downwards and outwards, in a direction parallel to the ramus of the left os pubis; a blunt-pointed bistoury is to be conducted along the groove into the bladder, and the whole extent of the passage to be divided. If this

incision be not sufficiently large for the extraction of the stone, then the neck of the bladder must be divided ; the shorter the incision required in this part, the better for the patient's subsequent comfort.

SOLUTION OF STONE.

VARIOUS attempts have been made, from time to time, to dissolve stone in the bladder, sometimes by internal remedies, administered by the mouth, at other times by chemical agents thrown directly into the bladder, by Hales, Rutherford, and others. The injection made use of by Dr. Rutherford, was lime-water, but as the patient was taking soap freely by the mouth, the alkaline urine which it produced became a weak solution of caustic soda under the influence of the injection ; Dr. Ritter's injection, in his successful case, was a solution of caustic potash ; Dr. C. Petit made use of the natural Vichy water, or solution of bicarbonate of soda in tepid water ; Magendie and Amussat employed a very dilute solution of sulphuric acid ; Sir B. Brodie, again, had recourse to nitric acid, in the proportion of two minims, and two minims and a half, to each ounce of water, with success*.

Since the publication of my last edition, Dr. Hoskins, of Guernsey, has brought under the notice of the profession, a solvent for phosphatic calculi, which is quite unirritating, and can be borne in the bladder for any length of time without the slightest inconvenience. Amongst the cases in which

* Willis on Treatment of Stone, p. 176.

this solvent has been tried, is one of my own, in which I have noticed with great interest its employment. The composition of the solvent, and the result of its trial, will, I have no doubt, be soon published.

The mineral waters of Vichy* have been tried as solvents for stone, and it seems also undeniable that several persons in whose bladders the presence of calculi had been ascertained by sounding, had them either notably reduced in size, or got rid of them entirely, all the symptoms of stone being at the same time relieved or removed, whilst using this water internally.

M. Chevallier† was the first who instituted direct experiments on the powers of the alkaline water of Vichy, to dissolve and disintegrate urinary calculi. The following are the particulars of some of his trials:

1. A quantity of lithic acid gravel was subjected to the action of the Vichy water, kept at a temperature of 97° F. The concretions were speedily

* There are seven principal springs which pour out these waters, the product of each differing but little from that of the rest. The composition is as follows:

Water	from 991,9 to 994,9	
Carbonic acid gas	1,2	0,93
Carbonate of soda	5,5	4,7
Carbonate of lime	0,6	0,3
Carbonate of magnesia	00,9	00,6
Muriate of soda	0,57	0,52
Sulphate of soda	0,47	0,27
Silicia	0,1	0,04

† Essai sur la Dissolution de la Gravelle, &c. 1837.

destroyed ; the lithic acid being entirely dissolved, and nothing remaining suspended in the fluid but a few loose flocculi of animal matter.

2. The half of a lithic acid calculus weighing 1 ounce, 1 drachm, $36\frac{1}{2}$ grains, was placed in a little bag of wire muslin, and subjected to the action of the Vichy water during 151 hours : dried carefully and weighed after this, the calculus was found reduced to two drachms, 52 grains ; so that in less than a week it had actually lost 6 drachms, 47 grains, or more than two-thirds of its original weight.

3. In another experiment, five calculi, one of phosphate of lime, weighing one drachm, 18 grains ; a second of lithic acid, weighing one drachm, 8 grains ; a third of lithic acid, weighing 25 grains ; a fourth and fifth, fragments of phosphatic calculi, weighing, the one 29 grains, and the other 13 grains, were enclosed together in a bag of wire muslin, and exposed, on the 5th September, to a constant stream of the Vichy water, of the temperature of about 98° F. On the 11th September, the bag being examined, was found completely empty ; the calculi of lithic acid had been dissolved, those of the phosphates, disintegrated, and their particles washed through the meshes of the muslin*.

Contrary to the usually entertained opinion, M. Petit found, that, on the whole, calculi of the triple phosphate of ammonia and magnesia lost most

* Willis on Treatment of Stone, p. 171.

under the action of the Vichy water, *i. e.* of a solution of bicarbonate of soda in water supersaturated with carbonic acid, than those of the lithic acid. For example: Five specimens of lithic acid calculi, weighing together a little more than 118 grammes, after remaining, on an average, twenty-seven days exposed to the action of the water, lost very near 64 grammes, or 53 per cent. of their original weight; but five specimens of the ammoniaco-magnesian phosphatic calculus, which, together, weighed rather more than 97 and a half grammes, and only remained under the action of the water, one with another, for the space of twenty-three days, lost fifty-eight grammes and three-fourths, or 60 per cent. of their original weight.

M. Petit, like M. Chevallier, found that the Vichy water had extremely little influence on calculi of the oxalate and phosphate of lime. This water, however, would dissolve calculi of cystine and xanthic oxide, with at least as much readiness as it disintegrates and dissolves those of lithic acid and the triple phosphate. Water surcharged with carbonic acid, and holding a little bicarbonate of soda in solution, is consequently a solvent for the calculi of every description that are of somewhat frequent occurrence, save those of the oxalate of lime. Such a water will therefore attack something like nineteen-twentieths of all the known varieties of urinary concretions.

The destruction of urinary calculi by an alkaline water is found to be, not merely, nor perhaps

even principally, by way of solution ; it is accomplished in a very considerable degree, especially as regards those of the triple phosphate, by a kind of disintegration of their component particles. When calculi which consist principally of the oxalate or phosphate of lime are mingled with a little lithic acid, lithate of ammonia, or triple phosphate, which they are very frequently, the alkaline water attacks and disintegrates them rapidly, so that the sphere of its activity is still farther extended.

THE number of foreign bodies, besides proper urinary calculi, which have been found in the bladder is immense. Both in males and females, hair, beans and peas, fruit-stones, ears of corn, portions of bougies, nails, bullets, small bones, pins, needles, string, stalks of flowers, &c. &c., have all been extracted from the bladder ; these foreign bodies having frequently formed the nucleus of a stone*.

Several instances of hair voided by urine are mentioned by Sir Hans Sloane : one particularly of a brewer, who suffered from the occasional passage of long hairs, matted or woven together, passed with great pain, but with little or no calculous matter attached to them. Mr. Powell relates a case of a middle-aged lady, who, after being teased with disordered stomach and bowels, and evacua-

* I would refer the curious on this subject to the "Dictionnaire des Sciences Médicales," t. vii. p. 38.

tion of whey-coloured and fetid urine, passed little masses of hair, mingled with a peculiar viscid mucous substance, partially crusted with calculous matter. The excretion of these masses was attended with aggravation of the distress and pain in the bladder, from the urine bringing them into contact with the orifice of the urethra. The complaint, which in this case continued long, induced great weakness and much wasting of the body. Dr. Wallace also met with an instance, in which hair was several times voided with the urine; and on the body being examined after death, a stone was found in the bladder, large as a goose's egg, from parts of which hairs had grown out. It was thought that the hairs voided during life, which were a great many, and some of an extraordinary length, grew out of that stone; because when the hairs hung out of the urethra, as they frequently did to the great torment of the patient, they were obliged to be pulled out, which was always done, with a resistance, as if plucked by the root*.

Musket-balls have found their way into the bladder, sometimes occasioning very little inconvenience, at other times giving rise to very distressing symptoms. Larrey, Ballingall, and other writers, mention cases of this kind. The presence of these bodies in the bladder is indicated by pain, more or less acute, weight in the perinæum, tenesmus, dysury, strangury, and bloody urine.

“Some time ago,” says Mr. Ingleby, “I was

* Howship, *op. cit.* p. 167.

called to a woman, a female catheter having unfortunately been allowed to pass entirely into the bladder. The patient was in the fourth month of pregnancy, and had experienced a retention of urine, by no means uncommon, just before the uterus finally quits the pelvis for the abdomen, but in this instance occasioned by the womb being considerably prolapsed—a circumstance which it is material to mention. At the time I saw the patient, the catheter had been in the bladder eight hours. It lay in the centre of the organ, quite transversely; and, the urine having dribbled away, the bladder was in as contracted a state as the catheter admitted of. By means of a long and very slender pair of forceps, passed per urethram, I embraced the instrument near one end, and with the two first fingers of the left hand, passed by the vagina, carefully elevated the other end; and having thus brought it into the horizontal direction, gently extracted it. As little injury as possible was inflicted upon the patient; nevertheless, the ovum was discharged on the third day, but without hæmorrhage. The foetus presented a perfectly white and beautiful appearance, the scalp excepted, under which there was a considerable extravasation of blood; and to mechanical injury (occasioned no doubt by the difficulty in giving the catheter the horizontal direction) its death may be directly ascribed*.”

Mr. Toogood, of Bridgewater, has recently published in the Medical Gazette two interesting cases,

* On Uterine Hæmorrhage, p. 106.

where a female catheter slipped into the urethra. In both cases, the instruments were extracted by dilating the urethra by the sponge tent, so as to enable the fore-finger to be introduced into the bladder.

Mr. Key and myself saw, some years ago, a case, where three inches of a thin gum-elastic catheter broke in the urethra, near to the bladder, and although we were called to the gentleman immediately after the occurrence of the accident, we could not lay hold of the broken portion. Three weeks after this, the fragments (for there were two, one an inch in length, and the other two inches) were voided by the urethra.

If the body be small and have not fallen into the bladder, so that one of its extremities rests in the neck of the bladder, or in the canal of the urethra, it may be expelled by the urine a short time after its introduction, and before it becomes coated with much saline matter. If the foreign body be not passed by the urethra, efforts should be made to extract it by means of Weiss' instrument for extracting small calculi. Hunter and Desault invented forceps for extracting foreign bodies from the urethra; but Bichat states that he had never succeeded in any attempt at extracting from the dead body portions of bougies inserted into the bladder. Of late years, however, since the improvement of vesical instruments, the operation has repeatedly been successfully performed.

Hydatids have been discharged from the urethra,

and after death numbers of them have been found floating loose in the bladder. In such cases, it is most probable that they have descended from the kidney along the ureters, or that they have been introduced into it from a cyst formed in the pelvis, which had opened by ulceration into the bladder. Worms also have been discharged with the urine; an instance of which is related by Mr. Lawrence in the *Medico-Chirurgical Transactions*.

Mr. Curling* has given an account of some worms which he discovered in the urine, and which do not appear to have been described before. The urine in which the worms were contained was high-coloured and slightly acid. It was observed that when first passed they floated separately in the urine, but in a short time they coalesced and coiled themselves up together in the form of a ball, at the bottom of the vessel, and it was with difficulty that they could be separated. When they were disturbed, their motions were often very lively; and if allowed to remain in the urine, they lived for two or three days. They were very transparent, so that the contents of the alimentary canal could easily be distinguished by the naked eye. On immersing them in spirits of wine they soon became white and opaque. They were of two sizes; the larger worms being more numerous than the smaller.

A slight examination at once convinced Mr. C. that these worms could not belong to any of the

* *Medico-Chirurgical Transactions*, vol. xxii.

species of entozoa at present known to infest man ; and considering the period of the year, he was at first induced to imagine that they must have been the larva of some insect. On placing one in the field of a microscope, he recognised a beautiful organization, and true nematoid structure, and on reference to Rudolphi's *Synopsis Entozoorum*, and other works on this subject, discovered that it was an entozoon, which had not hitherto been described.

CHAPTER XII.

WOUNDS AND INJURIES OF THE BLADDER.

RUPTURE of the bladder may either be complete, or may involve only the mucous and muscular tunics. After the reception of an injury, the sudden occurrence of pain in the region of the bladder, incapacity to expel the urine, absence of tumour of the bladder when examined through the rectum or vagina, and a scanty discharge of jets of bloody urine by the catheter, will in general point out the real nature of the accident. In relation to diagnosis, it is to be observed, that although the bladder has been ruptured, there is often a circumscribed tumour in the hypogastric region.

Wounds of the bladder within the peritoneal sac, or even behind the reflexion of the pelvic fascia, are almost inevitably mortal: they may be inflicted from without, by pointed weapons; or from within, as in rash and ill-conducted operations for stone; or they may be the result of violent injury, and solution of continuity in the bones of the pelvis. A wound of the posterior fundus, through the rectum, if it do not pass beyond the bladder, is not necessarily attended with great risk. Foreign bodies, as bullets, have,

at various parts, entered the viscus, the immediate effects of which have been recovered from ; and their removal has, after a time, been accomplished by incision of the perinæum.

In fractures of the bones of the pelvis, the bladder is often injured, either by the force of the concussion, or by a spiculum of the fractured bone penetrating the coats of the bladder.

I have known the bladder to be ruptured by a fall from the top of a coach. A gentleman was riding on the box, with his coachman, when the carriage was upset, the coachman fell on him, and by this accident the bladder was ruptured. The patient lived from the Sunday on which it occurred till the following Wednesday.

The bladder is sometimes ruptured by external violence, in boxing-matches. If, in these, one throws the other on the ground, he may fall upon him with his knees ; and as, from previous drinking, the bladder may then be full, its rupture has occurred.

It would appear from Dr. Harrison's investigations, that when the distended bladder in the male has been ruptured by a fall or blow on the hypogastric region, or by a general concussion, that portion of it which is covered by the peritonæum has very generally been the seat of rupture ; the urine has consequently been effused into the abdomen, and the patient has been destroyed by peritonitis.

The following is the explanation offered by Dr. Harrison of the fact, why, when the bladder is

ruptured by a blow, or general concussion, the laceration is always found in that part of the organ which is covered by the serous membrane. The several tunics of the bladder allow of considerable distension, but least of all the peritoneal: when, therefore, the bladder becomes fully distended, and is then subjected to any sudden or violent compressing force, this tunic, which is then tense, and comparatively unyielding, will crack, while the subjacent tunics which are connected to it will be torn along with it; whereas, in other situations where cellular tissue occupies the place of the serous membrane, the coats of the bladder will yield considerably before they give way or admit of laceration. (See *Dub. Jour. of Medical Science*, vol. ix. p. 371.) The bladder being pressed forcibly against the promontory of the sacrum in the male, seems also to account for the rent being usually in the posterior region of that viscus.

The rarity of the accident in females is ascribed by Dr. H. to the greater size of the pelvis, the cavity of which is not so extensively occupied by the bladder when this is full of urine. Nor (says he) does the bladder incline so much backwards as in the male; on the contrary, it inclines more forwards, and enlarges more in the transverse direction; while the uterus and its lateral broad folds, may assist to break the shock of any external violence, applied to the hypogastric region, and so prevent the direct concussion of the bladder against

the sacral promontory*. The comparative unfrequency of a rupture of the bladder, in children and boys, is referred, by Dr. Harrison, to their rarely suffering the bladder to become much distended with urine, and, in part, to the smaller size of the sacral promontory, and to the bladder, when full, lying in early life more in the abdomen.

When excessively distended, the bladder may give way : a case of this kind is mentioned by Sir E. Home†, and another by Dr. Johnstone‡. In such cases, the urine escapes into the cavity of the pelvis ; and all that we can do, is to introduce a catheter, and leave it in the bladder, in order to limit, as much as possible, the quantity of urine effused.

These cases almost always terminate fatally. On examination, the cellular tissue of the pelvis is found in an inflamed, or rather sloughing state ; there is one or more small pin-holes, with black and ragged edges, near the fundus of the bladder ; and the viscus is found relaxed and empty, whilst the abdomen is full of urine. It is not properly a rupture which then takes place, but more like that ulceration which occurs in the urethra, and lays the ground-work of fistula. Owing to excessive distension, ulceration takes place ; the coats are weakened ; and the urine bursts through them.

* Harrison in *Dublin Journal of Medical Science*, vol. ix. p. 352 & 372 ; and Mr. S. Cooper's *Surgical Dictionary*, 6th edition, p. 266.

† Home on *Strictures*, vol. ii. p. 241.

‡ *Memoirs of the Medical Society*, vol. iii.

In cases of labour, the bladder has been known to burst ; and most practitioners concur in thinking that such an accident must always be the effect either of neglect or of improper interference.

In a case of this kind related by Mr. Hey, in the fourth volume of *Medical Observations and Enquiries*, the bad symptoms attendant on retention of urine did not take place till the second day. The patient was thirsty, vomited, had frequent desire to void urine, which she did very suddenly, but not in greater quantity than a tea-spoonful at once. The pulse was quick, the belly swelled, and pressure gave her pain. She died about the eighth day, and the bladder was found to be ruptured at its upper part.—A case is also related by Mr. Bedingfield, in which the bladder seems to have burst during a very easy labour of only two hours' duration. The patient died of peritoneal inflammation*.

One cause of laceration of the bladder may be the use of instruments in a distended state of that organ. If the forceps be applied whilst the bladder is full, the action of the instrument is likely to produce laceration ; and this is known by the immediate and continued flow of urine through the opening.

In consequence of great pressure from the head of the child, destruction of a portion of the vagina and bladder may take place,—an occurrence attended with most distressing symptoms. The urine

* *Lancet*, June 1837, p. 371.

dribbles away as fast as secreted, and excoriates the neighbouring parts. The protruded mucous surface of the bladder is then very sensitive, and the vagina is frequently contracted in size by firm bands, extending across it in various directions. With all these local symptoms, the patient's general health is but little affected. I have seen four or five instances of this injury, in all of which little could be done in the way of relief. The difficulty of closing an opening through which urine is constantly passing, deterred surgeons, until late years, from attempting other than a palliative treatment. Mr. Barnes, of Exeter, employed an elongated caoutchouc bottle, which, when placed in the vagina, presents an opening corresponding to the fistula. This opening is occupied by a piece of sponge, through which the urine filters into the bottle. The patient herself removes the bottle and empties it three or four times a day*. For the same purpose sponge has been employed in a case, which resisted some attempts to effect a cure†.

The cure of the disease by ligature was first contemplated by Mr. Preston, and the operation has been performed successfully by Mr. Leake, Mr. Gosset, and the late Mr. H. Earle. Two cures are also recorded in the second volume of the "Dublin Medical Journal," and one by Mr. Hobart, of

* Med.-Chirurgical Transactions, vol. vi.

† Transactions of the Provincial Medical and Surgical Association, vol. i. p. 542.

Cork, in the "London Medical and Physical Journal," for 1825.

The late Mr. Earle published, in the fifth volume of the Medical Gazette, a valuable paper on this subject, an abstract of which I subjoin :—

"The sources of difficulty attending these cases are manifold. One is, the continual flow of urine, and the vicinity of the termination of the ureters. Another is, the very narrow space for performing any operation, often rendered more narrow by preternatural contractions, and firmly cicatrized bands. A third arises from the exquisite sensibility of the exposed mucous membrane of the bladder. Then the moist, unresisting, elastic surface, eludes the impression of any cutting instrument, the edge of which is almost immediately blunted by the action of the urine. Even when these difficulties are surmounted by perseverance, and a modification of the various instruments, such is the influence over the pelvic viscera exerted, by the slightest movements of the viscera of the abdomen, and by the action of the abdominal muscles and the diaphragm, that the adaptation of the denuded surface is often frustrated, and even the sutures forcibly torn away, by a single effort to cough or sneeze.

"When the opening," continues Mr. E., "is not situated between the urethra and ureters, or in the neighbourhood of the latter tubes, when it is not of great magnitude, and when there is not much hernia of the bladder, we may attempt to remove

the callous edges, and unite them by the assistance of sutures. We shall be much facilitated in this operation by previously dilating the urethra sufficiently to admit the fore-finger of the left hand; by which we shall be enabled to draw down the bladder, and to afford a support and resistance in removing the edges. The instruments best adapted for this purpose, are very narrow double-edged scalpels, or lancets, with which we may pierce through the membranes, and cut our way outwards. These should cut only to a short distance from the extremity. It will be better to commence at the extreme edges of the opening, and not to attempt too much at any one operation. By several operations, we may gradually diminish the aperture, but, by attempting too much, we shall be foiled altogether. In order to convey a suture through the edges, to hold them in contact, it will be necessary to employ *porte-aiguilles*, with grooves, which will hold a glover's triangular needle at different angles, and with slides adapted for holding or letting loose the needle. The following is the mode in which I have employed this:—An armed needle should be fixed at the angle most convenient for piercing the denuded edges of the wound, which should be directed by the finger, and carried through the two edges. The point should be received by the other *porte-aiguille*, and the slide pushed up to fix it. The slide of the first should then be drawn down, which will leave the needle in the grasp of the second, by which it

may be drawn through with its thread attached. To effect this in so narrow a space as the vagina, is often most difficult, and requires much patience and dexterity. The ligature should be drawn tight, and the ends cut off. I have also employed short hare-lip pins, and the twisted suture; but these are still more difficult to pass, and they cause much more irritation. In those cases, which, from the situation of the opening, or its magnitude, no curative means can be attempted, a well-adapted truss, with an elastic gum-pad, will often enable the patient to retain a considerable quantity of water, and to enjoy comparative comfort."

Mr. Coley has recently published a case in which he cured a vesico-vaginal fistula by ligature. In this instance, in lieu of a female catheter, a wood sound, one-third of an inch in diameter, was used during the operation on which the edges of the fissure were divided, and a forceps with a moveable ring, by means of which the needle may be retained at any angle with the greatest firmness, until the surgeon wishes to liberate it, which he can do by moving the ring towards the joint. The length of the instrument is eight inches and a half, and a drawing of it is given in the *Lancet* *.

Mr. Beaumont has suggested an ingenious instrument to be used in operating for this complaint; it is in the form of forceps, one blade of which is a needle curved towards its point, and close to the point is the eye of the needle. The

* 1838-9, p. 86.

other blade is broader on its opposing surface, less curved, and at its extremity has a hole, through which the needle-point, and just the loop of the ligature, are carried when the blades are closed. On the back of the broad blade is a spring, which, when pushed forwards, the blades being previously closed, catches the ligature on its point, and holds it at the extremity of the blade.

In using this instrument the operator has only to seize in its points, as he would with a pair of forceps, the border of the fistulous opening; the blades should then be closed, and the ligature will be carried through one lip of the aperture. The opposite border is then in like manner to be seized, and the blades to be again closed and firmly held so. The spring on the back of the broad blade is now to be pushed forwards, by which the ligature will be caught and held at its point. The blades after this are to be opened and gently withdrawn, leaving a double ligature passed through opposite points of the fistulous aperture. A second or more stitches may be made in the same manner, leaving in each a double ligature, so that the quilled or other suture may be afterwards formed.

The late Baron Dupuytren* extolled the actual cautery, except in those instances in which there was much loss of substance, and some interesting cases where the cautery was used, are related in the second volume of the *Dub. Medical Journal* by Doctor Evory Kennedy. Its application is ex-

* *Journal Hebdom.* No. 58.

tremely simple, and attended with inconsiderable pain to the patient. Delpech advocated the employment of the actual cautery; and Velpeau, though giving a general preference to the nitrate of silver, still thinks that in a case of long standing, with loss of substance and callous edges, the actual cautery will be best as acting more rapidly and with greater energy. Delpech recommends that the vaginal surface only should be touched with the hot iron, in order to prevent loss of substance from extensive eschars. After the first cauterization, if the solution of continuity has contracted perceptibly in all directions a second application should be made, and renewed until the opening is entirely closed. It should be observed that sufficient time must be allowed for contraction to take place. Contraction, after the application of the actual cautery, goes on sometimes for months. Delpech treated successfully, in this way, a case of vesico-vaginal fistula, in which the aperture occupied the bottom of the bladder.

The cauterizing-iron should be small, round, or olive-headed, and should be applied cautiously, and but for an instant, as it will be much better to do little at once than too much. But whatever be the caustic employed, it should always be remembered, that the great obstacle to the adhesion of the edges of the fistulous aperture, is the contact of the urine; and therefore the utmost care must be taken to keep the bladder empty, and, if possible, dry, by placing a catheter with

large eyes, as in Desault's plan, or by drawing off the water very frequently, so as to divert it entirely from passing by the vagina*.

A case is related by Dr. Payan, in the London and Edinburgh Monthly Medical Journal, for January 1842, in which a cure was effected by the actual cautery, its application being repeated several times, at intervals of two, three, or six months, until the opening was all but closed.

Some surgeons have succeeded in closing slight apertures with nitrate of silver†; while others recommend the excision of the callous edges, and the application of some kind of suture.

When the accident happens from laceration, without loss of substance, it may occasionally be cured by a catheter retained in the urethra, with a bladder attached to its lower end, provided the treatment is commenced soon after delivery. By this contrivance Mr. Gaitskell effected a cure in a few weeks‡.

In all cases where we have the least reason to apprehend sloughing of these parts, the most scrupulous attention should be paid, from the period of delivery, to cleanliness, &c.: for this purpose tepid injections frequently thrown up the vagina, containing seven parts of infusion of chamomile, with one of camphorated spirit, or the decoction

* Cyclop. Pract. Surgery, Art. Vesico-vaginal Fistula, part xi. p. 233, by W. B. Costello, M.D.

† Lancet, No. 619, p. 485.

‡ Blundell's Lectures, Lancet, No. 222, p. 334.

of poppy, with sulphate of zinc or alum, will be found most useful. Where sloughing is decidedly threatened, more active injections must be had recourse to.

CHAPTER XIII.

ACUTE INFLAMMATION OF THE PROSTATE GLAND.

THIS gland, in common with every other part of the body, is subject to inflammation, which may be either of an acute or chronic kind. In the acute form, there are heat and pain in the perineum, extending towards the anus; frequent micturition; and scalding in making water, which is increased as the *acceleratores urinæ* contract to expel the last drops of urine. Evacuations from the bowels also cause great uneasiness, and there often remains a sensation as if the rectum was not completely emptied, giving rise to distressing tenesmus. If the finger be introduced into the rectum, the gut feels hot, and sometimes the prostate is felt as a smooth, round, and hard body, projecting downward on the bowel, which the pressure made by the finger renders exceedingly painful.

If a catheter or sound be introduced into the bladder, it passes without difficulty or uneasiness as far as the membranous part of the urethra; but its passage through the prostatic portion of this canal is attended with most acute pain, and accompanied with severe spasmodic contractions. All the above symptoms are much aggravated in the

sitting or standing position, by violent exercise or fatigue of any kind. Beer, coffee, and spirits should be refrained from, and exposure to cold or damp or any sudden change of temperature as much as possible avoided.

The inflammatory action, if not checked, shortly extends to the neck of the bladder, and, not unfrequently, to the whole inner lining of the bladder; then total retention of urine frequently succeeds, intense febrile symptoms supervene, accompanied with delirium; and in this stage the patient may die, if the bladder be not relieved, and the inflammation not subdued.

The pressure made by vesical calculi on the neck of the bladder, the constant irritation their presence creates, and which, by the continuity of mucous tissue, is so readily transmitted to the prostatic portion of the urethra—act as predisposing causes to inflammation of the prostate itself. Of the same nature are the morbid secretions proceeding from vesical catarrh, or from a diseased kidney, which directly or indirectly act upon the prostate, and excite inflammation either in its follicles, or in the cellular tissue that envelops them.

Another common cause of this inflammation are old strictures in the urethra, and it rarely happens that the obstacle they present to the free flow of urine, does not produce inflammatory affections in the prostate, the intensity of which usually is in relation to the degree and extent of the constriction.

During the existence of a gonorrhœa, prostatic inflammation not unfrequently occurs. In this case, the discharge diminishes, or nearly ceases, as soon as the gland becomes inflamed, and the pain which was confined to the anterior part of the urethra is referred to the perinæum, accompanied by a disagreeable sense of fulness, and by tenderness, increased by standing or sitting.

The internal use of the gum-resins and astringent injections employed in the treatment of gonorrhœa, are also among the exciting causes of prostatitis.

Gravel proceeding from the bladder, lodging among the prostatic lacunæ, and those concretions that not unfrequently form in the same situation, likewise produce prostatitis.

As the prostate partakes of the excitement of the venereal orgasm in sexual intercourse, we can perceive why excessive venery may be an occasional cause of the same affection.

Exposure to wet, particularly of the feet, or the immersion of the feet in cold water, especially in rheumatic subjects, is apt to produce acute inflammation of the prostate, where there is the slightest predisposition to the disease.

Too nutritious and highly-seasoned viands, and the excessive use of vinous and spirituous liquors, can often be traced as giving rise to prostatic inflammation.

The French writers on this disease, impute its

occurrence occasionally to the use of strong coffee as a refreshment.

Cantharides are well known as inflammatory excitants of the genito-urinary system, whether employed externally or internally, and often set up inflammation in the prostate.

Persons who are obliged to travel much on horseback, are often the subject of prostatitis, which is occasioned by the constant friction and concussions to which the perinæum is exposed.

This disease very often affects those of opposite pursuits,—the man who sits for a long time in his counting-house, and the studious, who too often neglects to obey the call to stool, or to satisfy the natural desire to empty the bladder; hence, in the one instance, we have piles, fistula, &c., in the other, disease of the prostate gland, and bladder.

Worms situated in the lower bowel have been observed at times to cause considerable irritation in the prostate, which is allayed only by the expulsion of those parasites. But besides worms, other causes that keep up a continual irritation in the rectum are capable of setting up inflammatory action in the prostate, such as habitual, obstinate constipation. The same cause will also produce a varicose state of its veins, as well as of those of the extremity of the rectum. During the efforts of defecation, the venous blood being forced to the bottom of the pelvis distends the veins, and

makes them varicose; and thus the prostate is increased in bulk, independently of any lesion of its tissue.

The abuse of those purgative medicines which act principally on the rectum, as for instance aloes, will give rise to disease of the prostate. In cases of dysentery also, in which there is much congestion of the rectum, the prostate may become inflamed from the effect of continuity.

Sir E. Home considered the disease as entirely local, produced by local violence, kept up by local circumstances, and having all its symptoms aggravated by a succession of causes of irritation belonging to the organs to which the prostate gland is attached.

When, through active and appropriate treatment, acute inflammation of the prostate terminates in resolution, all the symptoms indicated above diminish; at the same time, the liquid secreted by the follicles of the gland augments in quantity, and, mixing with the urine, in the form of a whitish or greyish viscid matter, settles at the bottom of the vessel without adhering to its sides, having a good deal the appearance of pus imperfectly elaborated. This matter diminishes in its turn, and finally disappears, as the functions of the affected parts return to their healthy and natural condition.

Acute prostatitis demands the employment of the most active antiphlogistic treatment.

If the attack is severe, blood may be taken, by

cupping, from the loins or perinæum. Leeches, moreover, may be applied above the pubes, particularly when pain is there experienced, or in the perinæum. The French practitioners recommend the application of leeches on the rectal surface of the prostate, by means of a speculum introduced into the anus.

Mr. Wm. Craig* relates a case of diseased prostate in which he employed a particular method of applying leeches directly to the gland, differing both from those of Henderson and Bejin. It consists of a tube into which is fitted a piece of wood, with a handle at one end, while the other terminates conically in a blunt point, for the purpose of gradually dilating the rectum. When this is effected, the wooden dilator is to be withdrawn, and a box of proper size to fit the tube, and capable of holding three or four leeches, with a piece of wire to form a handle fixed into the bottom of it, is to be pushed through the tube.

It is necessary to lubricate the wood and the tube with oil previous to using it, and in introducing it, it should be directed towards the rectum in order to prevent its coming in contact with the tender prostate.

In elderly persons, the efficacy of taking blood is more doubtful, and the relief obtained by it is only temporary.

After depletion, morphia allays irritation, and assists in removing inflammation. Its preparations

* Lancet, vol. ii. Session 40—41, p. 299—300.

may be given internally, or may be used per rectum, and repeated so as to subdue irritation, its constipating effects being occasionally obviated by a previous enema of hot water, and by small doses of gentle aperients. "If, in defiance of these means," says Sir E. Home*, "the patient is unable to make any water, or although able to pass a few ounces, is every hour obliged to make the attempt, and, with much straining, does no more than void the same quantity, such symptoms are most undoubtedly not to be allowed to go on, since by their continuance, they are establishing a complaint, which if the symptoms are arrested in their progress, will get well. A flexible gum catheter, should be passed without a stilet, in the most skilful manner, into the bladder, using the smallest degree of violence that is consistent with the nature of the operation, and when the bladder is emptied, the instrument should be retained in the bladder, the water being drawn off at regular intervals, not only till the first symptoms go off, but till the bladder can retain the water for the usual length of time, and the water, when voided, has the appearance of healthy urine. The means to be employed in preventing and assuaging pain are Dover's powders in different quantities, according to the urgency of the symptoms, and opiate glysters. As soon as the parts have recovered themselves, the catheter is to be withdrawn, and there is every reason to believe it will not be

* Home on Diseases of the Prostate Gland, vol. ii. p. 92.

necessary to introduce it again on the present occasion."

Hot bathing generally, as well as locally, gives relief.

Febrile symptoms and constitutional derangement must be attended to, by withholding food, and permitting the use only of bland and diluent drinks.

When rigors occur, with increase of febrile symptoms, quickened pulse, hot skin, furred tongue, &c., as well as greater sense of fulness and tension in the perinæum, more frequent calls for, and greater difficulty of micturating, it is most likely that suppuration is taking place. If at this period we examine the prostate through the rectum, we shall no longer find it hard and resisting, but on the contrary, it will be found to so greatly resemble the bladder, that inexperienced persons would most likely be led into error; the examination per rectum, as well as the discharge of fæces, cause great pain; and there is constant tenesmus, with a burning sensation in the part.

The fibrous investment of the prostate, softened by inflammation and distended by pus, favours the escape of a creamy and sanguineous matter into the urethra, the rectum, or the bladder: then the tumour diminishes, the urethra becomes free, the urine flows in a large stream, and as the bladder empties itself, the patient feels his sufferings decrease.

If the abscess opens into the urethra, a very

copious purulent discharge instantly manifests itself from that passage : the urinary discharge is accompanied, but more frequently preceded or followed, by the evacuation of a large quantity of phlegmonous matter, the specific gravity of which is much greater than that of the urine and the vesico-prostatic mucous products. After the last drops of urine are voided, there is a stinging pain which lasts for a few minutes, or for a much longer period, according to circumstances. There is in some cases more or less blood mixed with the discharge, and I have known a considerable hæmorrhage take place. There is also a pain in the glans penis, as if a burning coal was applied to it*.

It is desirable that the matter of the abscess should find its way neither into the rectum, the urethra, nor behind the bladder, which may be fatal, but should pass to the surface, in order to discharge its contents more freely, and heal more readily. We must not, therefore hesitate, where fluctuation can be discovered, to make a puncture with a lancet, without waiting its presenting at the surface.

Should the disease have anticipated the operator, and the abscess have opened in the perinæum or the rectum, nothing can be done beyond maintaining the general health. Should the abscess have burst into the urethra, or at the neck of the bladder, it would be better to allow a flexible catheter to be retained in the canal, until there

* Home on Diseases of the Prostate Gland, vol. i. p. 225.

is reason to believe the abscess is healed, than to practise its frequent introduction. Most commonly the matter gradually diminishes in quantity, and ceases entirely after a time. In other instances the discharge disappears for a time, and then comes on, and this may occur several times before the patient completely recovers.

In these cases, ulceration of the surface of that portion of the prostate which projects into the bladder sometimes occurs. In this state, or even in that of mere enlargement, the gland is liable to bleed. This usually will cease by antiphlogistic treatment, and keeping the patient entirely in the recumbent position.

CHAPTER XIV.

CHRONIC INFLAMMATION OF THE PROSTATE
GLAND.

IN the preceding chapter I have described the terminations of the acute form of this disease by complete resolution, and by suppuration ; but these two modes, as Verdier* justly observes, are not the only ones in which it terminates. The inflammatory action very frequently is subdued only, not totally extinguished, by the treatment that has been adopted: a state of engorgement still remains, which either spontaneously, or through some accidental excitement, readily resumes that action, which, in its abated form, is known as chronic inflammation.

This prolongation of the inflammatory action under a chronic form, very frequently occurs in those who are subject to rheumatism and cutaneous eruptions.

Sometimes, also, in feeble subjects, the antiphlogistic treatment stops the progress of the inflammation at a period of the disease when pus has already formed in the parenchyma of the prostate, but which has not effected its discharge outwards.

* Obs. sur les Phlegmasies de la Prostate, p. 110.

Disseminated in the cellular tissue, or contained in several small abscesses, this purulent matter undergoes the same change as sometimes happens in the pulmonary tissue, and which is not wholly re-absorbed: it is deprived of its more liquid parts, and reduced to its elements of greatest consistence. Thus we perceive formed tubercular depositions that soon become the subjects of frequent inflammation, while each fresh attack only increases the deposition; and in doing so, necessarily augments the size of the gland.

The above is one of the modes in which chronic inflammation of the prostate takes place; but besides this, the disease may originate in this form primitively, and the result of the long continuance of the morbid action be analogous to, if not perfectly identical with, the preceding—that is, deposition of serosity into the cellular tissue ensues on every fresh exacerbation of the inflammation; the more liquid portions of it being removed, and the albuminous that remains becoming organised.

As the progress of chronic inflammation of the prostate is usually slow, so the symptoms characterising it are far less distinct than those of acute prostatitis.

In this case the patient experiences a gradual increase of inconvenience and difficulty in micturating. When the enlargement is slight, he usually attributes his sensations to internal piles. When the enlargement is greater, he feels a sense of

weight and bearing down, and a desire to evacuate the fæces, although the rectum is empty.

As the disease advances, the urine is voided every hour, or even oftener; and that is effected so slowly, that it drops perpendicularly from the orifice of the urethra, or perhaps dribbles away involuntarily; a slight degree of pain being experienced in the course of the urethra, and in the glans.

These symptoms are all increased by much standing or walking; rheumatic pains are felt down the thigh and leg, and likewise in the loins; occasionally there is hæmorrhage from the penis; there is constipation, dyspepsia, headach, and frequently some scaly eruption on the skin.

Owing to the prostate being intimately connected with the neck of the bladder, every increase in the size of the former must affect the latter; causing some alteration in the exercise of its functions. The loss of power to empty the bladder, is apparently the first effect thus produced, and its consequences are very serious. If, after the patient has exerted himself to empty the bladder, an ounce or two of urine are left in it, the desire to micturate scarcely ceases before it returns, and requires efforts similarly vain to expel it.

Sometimes these symptoms occur suddenly. The patient awakes with a strong desire to micturate; he finds that he can scarcely pass any water; and, on inquiry, it is found that exposure to cold or wet, or irregularity in diet or exercise, had

previously occurred. Sometimes during sleep, the urine passes away involuntarily. The mucous follicles increase in size, and the surrounding cellular tissue becomes thickened, till, at last, the prostate becomes considerably enlarged, and the desire to pass water, as well as the difficulty in voiding it, increase proportionably to the size of the gland.

In other cases, the enlargement is, from the first, accompanied by incontinence of urine.

Tumefactions of the prostate, which are brought on by strictures, disappear when these are cured : it is necessary, therefore, to distinguish them from more permanent disease.

These symptoms are frequently produced by enlargement of the whole gland, or one of its lateral lobes ; and in these cases a ridge is sometimes thrown up, which acts like a bar to the vesical extremity of the urethra *.

In the progress of the enlargement, the two sides do not always swell equally : one often enlarges the most, and often swells more in one particular part than the other. This produces a lateral bend or obliquity in the passage, which of course will increase the difficulty of passing the urine and of introducing the catheter. It has been observed, that the left lobe of the gland often increases more rapidly and to a greater extent than the right, therefore throwing the lateral bend more frequently towards the right side ; the left lobe also frequently projects more than the right

* Vide Plate IV.

towards the cavity of the bladder. Sir Everard Home, who first noticed this circumstance, says, that he is unable to determine whether it arises from any peculiarity in the left lobe, or is only accidental; but it is deserving of notice, that he had, when he published his first volume on the disease of the prostate gland, never met with the same circumstance in the right lobe. An acquaintance with this fact may be of some use in cases where difficulty occurs in passing the catheter, as it may enable us sometimes to give the proper direction laterally to the point of the instrument. In the second volume, however, which was published in 1818, Sir Everard gives an engraving, where the right lobe of the prostate formed the largest projection towards the cavity of the bladder. He mentions that in two instances he had seen a similar enlargement of the right lateral lobe. I have met more than once with this greater enlargement of the right lobe. Sir Everard has very properly observed, that the knowledge of this will induce the surgeon, after trying gently first on the left side, to go immediately to the right, without persevering in farther trials on the left side*.

The third or middle lobe of the prostate is very subject to enlargement, and projects into the cavity of the bladder in the form of a nipple, pushing the membrane before it, so as to put it still more on the stretch, in the direction from the

* Wilson on the Urinary Organs, p. 335.

urethra to the verumontanum. In its further increase, observes Sir E. Home, it loses the nipple-like appearance, becoming broader from side to side, and forms a transverse fold by pushing forward the membrane, connecting it to the lateral lobes, which also become proportionally extended.

As the tumour and the transverse fold are situated immediately behind the orifice of the urethra, they are pushed forwards before the urine in every attempt that is made to void it, acting like a valve and closing up the opening till the cavity of the bladder is very much distended, when the anterior part of the bladder being pushed forward, and the tumour being drawn back in consequence of the membrane of the posterior part of the bladder being put on the stretch, the valve is opened, so that a certain quantity of water is allowed to escape, but the bladder is not completely emptied. A very small enlargement, however, of the middle lobe, projecting into the bladder, with the transverse membranous fold connecting it to the lateral lobes, is sufficient to produce a complete retention of urine.

As the gland increases in volume, the part juts out into the bladder, and some of the urine is kept back; consequently the bladder is unable to expel the whole of its contents: when the patient has voided all he has in his power to do, several ounces may still be left behind. The symptoms now are very distressing. The moment after urine has been passed, he has an inclination to

make more. He attempts to do so again, but with no better success: a little passes, but no relief is obtained. In this manner he goes on all day, and at night he suffers equally. His sleep is broken, he is obliged to rise every quarter or half hour to relieve his bladder. He becomes at length haggard and thin, and weak, and from the constant irritation, and pain, and watchfulness, is almost worn out.

Sir Everard Home* observes, that where the middle and left lobe both project considerably into the bladder, their surface is sometimes excoriated, and has the appearance of being ulcerated. When this happens, the pain that occurs after passing the last drop of urine is very severe, and is attended with spasmodic affections of the neck of the bladder, of the most distressing kind.

The first effect produced upon the bladder is inflammation of that part of the internal membrane in immediate contact with the tumor, for the muscular coat interposed between them is so involved in the thickened parts as to become entirely lost. This inflammation afterwards generally extends over its whole surface. The inner membrane of the bladder becomes in consequence extremely irritable; and this is a principal cause of the great and frequent desire, and consequent straining to make water, when there is even a small quantity in the bladder. The inflammation extends itself to the muscular coat,

* Home on Diseases of the Prostate Gland, vol. ii. p. 28.

and prevents the fibres from relaxing themselves to the same extent as in health, so that the bladder does not contain more than half the usual quantity of urine, before the most violent efforts are brought on to empty it.

We have the authority of Desault, Hunter, and Dr. Baillie, for setting the prostate down as the occasional seat of scrofula. Dr. B. *, after stating that he has seen a common abscess situated within it, adds, that it is also subject to scrofulous disease, as, on cutting into it, he has met with the same white curdy matter which is formed in a scrofulous gland: he has likewise forced out of its ducts scrofulous pus.

“The prostate gland,” says Mr. Wilson†, “is sometimes affected by scrofula. I have seen it enlarged and changed into a white curdy matter precisely the same in quality as that formed in a scrofulous absorbent gland. This swelling is slow in its progress; it is not attended with much pain; it may be felt by a finger introduced into the anus; and its effects on the stream of urine will depend upon the size it enlarges to and the form it assumes. In treating such enlargement, recourse must be had to sarsaparilla, cicuta, opium, liquor potassæ, sea-bathing, and electricity. Swellings of this nature are usually found in persons not advanced beyond the middle period of life.”

The size to which a diseased prostate attains,

* Morbid Anatomy.

† Op. cit. p. 330.

particularly when the lateral lobes are principally affected, is often very considerable. Mr. Guthrie *, speaking of a case of this kind, mentions that "the prostate was larger than a closed hand, had partaken of a cheesy-like suppurative process of this kind, and the whole pelvis was nearly filled up by a mass of disease of a similar character. In the more common kind of enlargement, the part is rather soft than hard, yielding a little to the touch, but is not elastic or springy, like a spongy tumour. The enlargement is sometimes but trifling, in which case the prostate retains its natural shape, and merely projects a little into and around the orifice of the bladder; but when it is considerable, as in very prolonged and neglected cases, it is often as large as a full-sized orange. One lateral half is usually much larger than the other, and protrudes into the bladder, giving rise to one or more projections, which cause great distress to the individual. The left side, I am led to believe, undergoes this change more frequently than the right, although no satisfactory reason can be given why it should be so; and whilst one projection is directly backwards and inwards, it sometimes is seen to form a second immediately behind the orifice of the bladder, and which is frequently supposed to be an enlargement of that part of the gland behind the entrance of the vasa deferentia, and which has been called, by Sir E. Home, the third lobe."

* Op. cit. p. 227.

A winding passage is, sometimes, formed through the prostate, by alterations in the shape of its cavity; the channel being thrown to one side, frequently to the right one—a circumstance to be recollected on passing the catheter, when obstruction is felt at the neck of the bladder. It obviously is one of the cases in which an elastic catheter will pass easily without a stilet, though with difficulty, or not at all, with one.

The catheter should either be passed every six or eight hours as the irritation returns, or it should be left in the bladder. In the latter case, after the first two or three days, it is a general rule to withdraw it, and repass it occasionally. If, however, it cannot be easily introduced, it will be better to secure it in the bladder, allowing the water to flow through it at intervals.

Sir E. Home says, that “wherever any degree of difficulty has occurred in passing the instrument the first time, it is always prudent to retain it in the bladder; for unless it is introduced again in five or six hours, its having been introduced at all is of little use; for in that period the bladder is generally as full as it was when the water was drawn off. Whether this arises from the accumulated fluid in the kidneys passing into the bladder, or from the pressure taken off from the *mammæ*, making them secrete more freely, is immaterial; but the fact is of importance, since it makes it necessary again to empty the bladder, and the disturbance the parts received in the first ope-

ration, cannot so soon have gone off, and, therefore, must increase the difficulty in the second attempt."

The usual mode of securing the catheter, is to apply a common T bandage, of which the longitudinal band is divided up the middle, into two portions, one of which lies in each angle between the scrotum and thigh, and to which the catheter may be secured by ligatures.

Should the patient not empty his bladder when the catheter is withdrawn, it must be re-introduced, and after a few days again taken out.

In some cases of diseased prostate, the urethra being very irritable, is liable to spasm at the membranous part; and as the gum catheter on an iron stilet is then certain to bring on spasm, a flexible gum catheter should be passed skilfully, and with the slightest possible force. When the bladder is emptied, the catheter should be retained by the means already pointed out, the water being drawn off at intervals till the first symptoms go off, and till the bladder can retain the water for the usual length of time.

The following method has been found successful, in cases rendered difficult by spasm: namely, to pass a gum catheter as far as possible without a stilet, and this will probably be to the enlargement of the prostate; then to introduce a stilet into the catheter, without withdrawing the latter from the urethra; and, finally, to employ the stilet to direct the point over the tumour of the prostate.

Mr. Hey pointed out another method of using the catheter, which has now and then succeeded. The catheter is to be passed with the stilet to the enlarged prostate—then the stilet is to be partially withdrawn, a manœuvre which tilts up the end of the catheter, and may enable it to ride over the protuberant gland.

In thus using the gum catheter in a flexible state, if it do not pass readily, owing to its having been softened and lost its curve by passing through the straighter part of the urethra, it should be withdrawn, and another employed.

When the parts are irritable, Dr. Mantell*, of Clapham, suggests that the catheter should be smeared with an ointment composed of five grains of acetate of morphia, and an ounce of spermaceti ointment; and relates an extremely interesting case of a large and inflamed prostate, in which this unctuous application was of great service.

Hitherto we have been going on the supposition that, though there be an obstruction to the evacuation of the urine, it is to be surmounted by appropriate remedies and the employment of the catheter. But it happens at times, not merely in this disease, but in other affections both of the bladder and urethra, that all our endeavours to relieve the distended bladder fail; and in order to save the patient's life, our sole remaining source is that of puncturing this viscus, and thus drawing off the urine. The spots usually selected for this opera-

* Lancet, vol. ii. Session 40—41, page 301.

tion, are either above the pubes or through the rectum.

The puncture above the pubes can be effected by a previous simple division of the skin, and separation of the recti and pyramidales muscles. A straight, long trocar is then to be used for the purpose of perforating the bladder; care being taken to retain the canula, and, by the position of the patient, to guard against infiltration. This is the mode of puncturing the bladder usually preferred in cases of enlargement of the prostate.

The puncture from the rectum can be performed without injuring any important parts. The canula of a curved trocar is to be passed along the finger of the left hand to the triangular space, bounded by the vesiculæ seminales and peritoneum; the stilet is then protruded, and the whole instrument pushed forwards into the posterior fundus of the organ. The canula is retained for a certain time, until the cause for the proceeding is got rid of. I have performed this operation several times, without the least difficulty, and it is the one which I prefer.

“I have never seen a case,” says Mr. S. Cooper*, “in which retention of urine from chronic enlargement of the prostate gland terminated in extravasation of urine from rupture of the bladder. Sir Astley Cooper never met with but one instance of it; and the reason of its rarity is given by Desault, who remarked long ago, that in every case of reten-

* Surgical Dictionary, p. 110.

tion, where the urethra is free from obstruction, the urine, after distending the bladder to a certain point, generally dribbles away through that canal, and the patient may live a good while in this condition. But the case is different when the retention depends upon any stoppage in the urethra, for the urine then does not partially escape; the distension increases, and if relief be not speedily afforded, the urethra gives way behind the stricture or obstruction."

Mr. Stafford* has recommended in case of enlargement of the middle lobe, the application of iodide of potassium and iodine to the gland, in the following manner. "A bougie," says Mr. S., "is to be charged at its point with the iodine, iodide of potassium, or any other substance you may wish, and then dipping it into melted tallow, so that a coating may be formed upon it: by such method, I have been enabled to introduce any application I might desire up to the prostate gland, without touching the surface of any other part of the urethra. The bougie having reached the desired spot, its point is allowed to rest upon the diseased part, when the tallow gradually melts, and brings the iodine or iodide of potassium into contact with it, and by drawing the bougie gently backwards and forwards, the necessary friction is produced. I have found it advisable to be very cautious as to the strength of the application, for the prostate

* An Essay on the Treatment of some Affections of the Prostate Gland, 1840, p. 19.

gland will not bear a strong preparation either of the iodine or iodide of potassium at first. It is usually in an irritable or inflamed state, consequently, even the mechanical pressure of the bougie will give pain. The preparations I have therefore used have been very mild. At first I have found it necessary to employ even anodynes, such as belladonna, opium, hyoscyamus, &c. to quiet irritation and pain. When these have subsided, I have begun carefully by introducing the iodide of potassium, in the proportion of one grain to the drachm of unguentum cetacei, and increasing it as the patient could bear it; I have then gone on with two, three, four, five, and even as far as ten grains or a scruple to the drachm, according as the case required it. After this I have added iodine to it, half a grain, one, two, three, four, and even more grains in the same manner."

Hæmorrhage from the prostate, whether arising from ulceration, from the accidental rupture of vessels, or from injury by the catheter, may be treated by opium and galls, or the subacetate of lead with opium, in doses of from one to two grains of the former to one of the latter, every six hours, or the infusion of roses with sulphuric acid and sulphate of alumen. In plethoric patients, or those subject to active hæmorrhage, such remedies should be preceded by general and local bleeding, injections of cold or iced water, &c. The catheter should, if possible, be avoided, during hæmorrhage; or, if irritation and useless effort to void urine render it

necessary, it should be allowed to remain, in order to keep the parts at rest. The bladder, if filled by coagula, should be washed out.

When painful sensations occur in the rectum, of which the symptoms are, distress in going to stool, painful tenesmus increased by efforts, or, when exertions are no longer made, and there is an aching uneasy feeling in the parts, the best applications are suppositories of extract of hemlock, with or without the extract of opium, and glysters of warm water, as a tepid bath, and as a means of procuring regular evacuations with little disturbance.

In middle-aged persons, and sometimes in young ones, the prostatic portion of the urethra and the neck of the bladder are often affected by irritation and low inflammation, which in both cause troublesome symptoms.

In advanced life, the slow return of the blood from the neck of the bladder, caused by its low and remote situation, as well as the complication of its veins, tend to dilate these, and to favour an accumulation of blood in them. This gives a tendency to disease, which, in elderly persons, is increased by violent horse exercise, by the irritation of the urine when of an irritable quality, dependent on a disordered state of the stomach and bowels, and especially by gonorrhœa and great sexual excitements.

Abscess of the prostate, resulting from mere chronic inflammation, occurs generally from forty

to fifty years of age, or even later: and it is usually, though not always, the consequence of stricture, accompanied by inflammation of the inner membrane of the bladder.

Fistulous communications are sometimes formed between an enlarged prostate gland, and the rectum, by incautious introduction of catheters or bougies.

Mr. S. Cooper justly observes that "in a considerable proportion of these cases, after a certain period not only is the muscular coat of the bladder much thickened, but the inner coat protrudes between the muscular fasciculi in the form of cysts, or little sacs. A sacculated bladder, as it is termed, is a frequent complication of enlargement of the prostate gland. Now these cysts may include calculi, and instances have been known in which they were filled with pus. But this is not all the mischief resulting from disease of the prostate gland; for, amongst other bad consequences, the complaint, by deranging the functions of the urinary organs, may bring on, and frequently does bring on, a morbid enlargement of the ureters and fatal disease of the kidneys*."

Mr. Stafford† has related a case of malignant disease of the prostate, in a child only five years of age.

The prostate gland was equal in size to the

* First Lines of Surgery, p. 605.

† Med. Chirur. Transact. vol. xxii. p. 220.

largest walnut, its form was somewhat globular, as is often the case with the enlarged prostate in advanced life. There arose from the prostate into the bladder, immediately behind the orifice of the urethra, a rounded nipple-like projection, nearly equal in size to a small hazel-nut, and exactly resembling, both in its appearance and situation, the projection of the gland usually ascribed to an enlargement of its third lobe.

On making an incision through one lateral lobe of the prostate, the cut surface exhibited none of the natural texture of the gland; it was decidedly encephaloid in colour, consistence, and texture, and one part of the cut surface exhibited so dark a colour as to present the idea of there being melanotic mixed with the encephaloid matter.

It may be necessary to observe that the prostate gland in a child of five years of age, is about the size of a small hazel-nut; consequently its increase of volume, in this case, was immense, and even its third lobe alone was as large as the normal size of the whole gland itself at that period of life.

The bladder was contracted to about the size of a turkey's egg, and on opening it, it contained about an ounce of urine mingled with purulent matter. The mucous membrane of the bladder was somewhat thickened; in other respects this organ was sound.

CHAPTER XVI.

PROSTATIC CALCULI.

DR. BAILLIE has given an accurate description of the cavities that are sometimes found in the body of the prostate, communicating either with the urethra or the bladder. "The prostate gland," he observes, "is sometimes seen with its cavity very much widened, and its ducts enlarged. In the natural state of the gland, the orifices of its ducts can hardly be seen, but they sometimes are so much enlarged as to be capable of admitting a crow-quill. When the ducts are so enlarged, there is always great obstruction to the passage of the urine through the urethra, arising most commonly from stricture there. The urine, either passing in very small quantity, or being entirely prevented from passing, is accumulated in the cavity of the prostate gland and the bladder. The effect of this accumulation is, that the cavity of the prostate gland is widened, and the ducts very much enlarged. The bladder, too, from making extraordinary efforts to overcome the obstruction has its muscular coat gradually thickened, and often to a very considerable degree. Attending, therefore, this state of the prostate gland, there is a thickened bladder, and an obstructed urethra."

It has been thought by some that the calculi found in cavities of the prostate had a similar origin and nature with stones in the bladder, but analysis has demonstrated the contrary; and that they are to be regarded pathologically in the same light as those concretions sometimes found in the salivary ducts and elsewhere—that is, as peculiar products of secretion.

The concretions form sometimes in great numbers at a time, and of small size, but, occasionally in smaller numbers and of a size nearly as large as that of a hazel-nut*. Often they do not exceed the size of the head of an ordinary-sized pin, and they are rarely larger, judging from those we have seen, than a pea. These calculi were first examined by Dr. Wollaston, who found them composed of phosphate of lime, mixed with more or less of animal matter. Dr. Prout informs us that he has met with calculi from the prostate gland containing a considerable proportion of carbonate of lime, and with five or six which contained very little earthy matter, but which were composed chiefly of a substance having considerable analogy to cystic oxide.

These calculi, when small, are nearly spherical, and have a yellowish brown colour: those of a large size are smooth and polished, and have the appearance of porcelain; precisely similar, indeed, to the phosphate of lime calculi. Dr. Prout is of opinion that these porcelainous calculi always originate in abscesses of the prostate gland. But

* Vide Cyclop. of Pract. Med. p. 339.

there are not a few of them in Dr. Hunter's collection of such a size that they could not possibly have been deposited in any cyst of the prostate gland. These calculi sometimes give little uneasiness, and are not suspected till after death.

"It is only when large, or numerous in one large cyst, or projecting into the urethra," says Mr. Crosse* "that prostatic concretions give rise to the symptoms of stone; frequent, painful micturition, and discharge of mucus, from inflammation of the urethra and neck of the bladder. They seem to be sufficiently often combined with stone in the bladder to lead us to suspect that the one disease contributes to the production of the other; and, indeed, I consider that urinary calculi, stricture of urethra, or whatever other diseases, here situated, causing inflammation of the prostatic part of the urethra, and interrupting the free exit of the excretion of the prostatic ducts, dispose to the formation of calculi of this description. When severe symptoms are produced by prostatic calculi, dysury, stricture, sacculi, and inflammation of the bladder, all ensue: and, in extreme cases, where a large prostatic calculus, or a cyst containing numerous small ones, is discovered, it may be right to cut down to the prostate gland from the perinæum, as in the lateral method of litho-cystotomy, and to remove such concretions.

"A distinction to be kept in mind in respect to prostatic calculi, is, that they are not urinary con-

* Vide Crosse, op. cit. p. 34, *et passim*.

cretions, but are formed and may increase without the urine having access to them ; they may notwithstanding rise to the orifices of the prostatic ducts or get into, and be detained in the urethra, or pass retrograde into the bladder, becoming the nucleus around which a deposit from the urine takes place.

“Concretions of another sort about the neck of the bladder ought to be noticed. In aged persons, particularly with hypertrophy of the prostate gland, a bladder diseased, and the veins about it and about the rectum varicose, concretions of phosphate of lime, varying in size from a pin’s head to a kidney-bean, are often found in the veins ; sometimes they present the appearance of a white pea, and an inequality or projection is observable, answering to the surface by which the body adhered to the coats of the vein. These concretions have no connexion with the urinary or any other excretions, and should not be regarded as calculi ; they are a morbid growth from the coats of the vein, to which, at an early period, they are invariably adherent.

“Their chemical composition is chiefly phosphate and carbonate of lime, and they approach nearer to ossific than to calculous concretions. Professor Meckel* has well represented these concretions ;

* *Tabulæ Anatomico-pathologicæ*, auctore T. F. Meckel, fasc. ii. tab. xiv. fig. 4, 5. Tiedeman, Otto, and Lobstein have treated upon these concretions, and met with them in the veins of the uterus, vagina, and spermatic cord.

but I know of no English author from whom they have received the same attention."

The diagnosis of prostatic calculi is seldom very clear*. A retention of urine, or pain about the neck of the bladder, and frequent desire to make water, are sometimes the only symptoms, and these are common to several other affections of the prostate gland and urethra. When the finger is introduced into the rectum, the gland may indeed be felt to be enlarged: but the nature and cause of such enlargement cannot in general be distinguished. In one instance, however, recorded by Dr. Marcet, the calculi could be plainly felt through the coats of the rectum, and a proposal was made to extract them by an incision in that situation; but the patient did not accede to so judicious a measure. (Med. and Chem. Hist. of Calculous Disorders, 8vo. 1817.) When a calculus projects from the prostate gland into the urethra, the end of a sound will strike against it; but then it can rarely be known whether the extraneous substance may not be a calculus that has passed out of the bladder into the urethra, or lies close to the neck of this viscus.

"The symptoms," observes Mr. Wilson†, "produced by calculi in the prostate gland, will depend on their size, number, and situation. When small and not projecting, they sometimes have produced so little uneasiness, as not to have been suspected

* Cooper's Surgical Dictionary, p. 1117.

† Op. cit. p. 355.

during life: they are generally, however, attended with some difficulty in voiding the urine, and a sensation of uneasiness about the neck of the bladder. This uneasiness is occasionally increased by violent exercise, but so it would be did it proceed from stone in the bladder. When they project towards the urethra, and produce a difficulty of passing the water, and an instrument is introduced either to search the passages, or the bladder, they will, in some instances, be found to grate against it, the calculi giving that peculiar feel to the surgeon which cannot be mistaken; but they may be pushed back by the instrument into the cavity of the prostate, so as not to be discoverable in several subsequent examinations. They have sometimes accumulated in such numbers, as to have been felt in a cyst through the rectum, and they have even ulcerated their way through the perinæum."

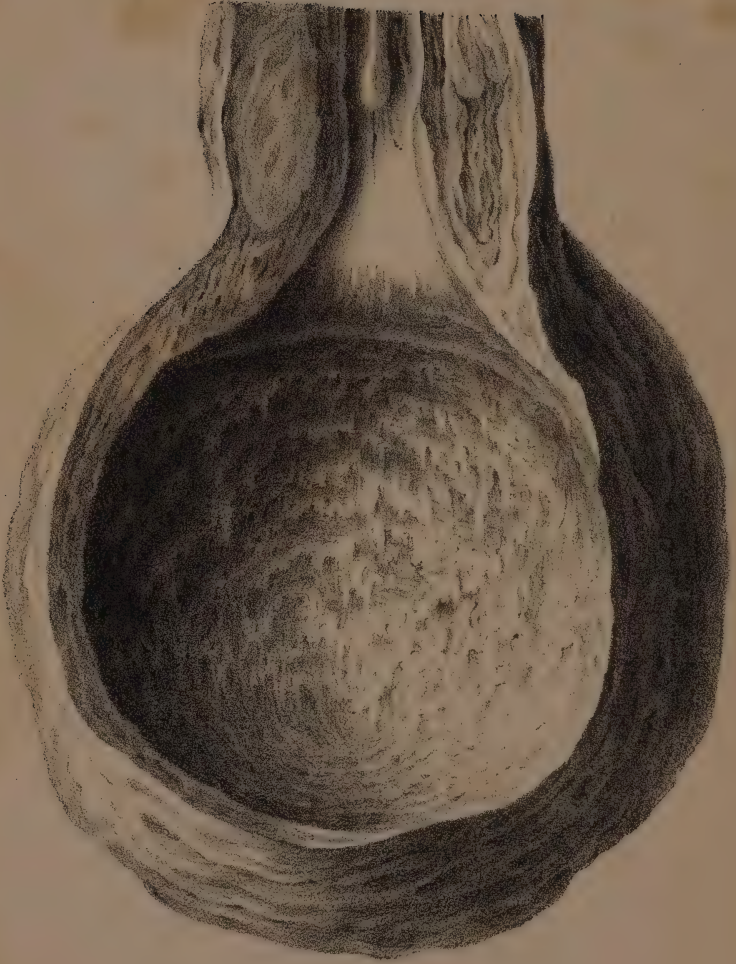
When prostatic calculi are known to exist and cause irritation, an attempt must be made to remove them by means of Weiss' forceps. In some cases this can be easily effected, and several calculi have been taken from the same individual by this instrument. When the calculi are so impacted as to elude the grasp of the forceps, and the symptoms caused by the calculi are so distressing as to demand surgical treatment, the patient must undergo an operation almost similar to that for stone.

The following interesting case of the kind came under my care some time ago:—

Mr. G. aged 46, of a full habit and strong constitution, had laboured for several years under stricture, from which, at times, he experienced much inconvenience. In the year 1830 he felt himself worse than usual; he had an incessant desire to make water, which came away from him in drops, or at other times required to be drawn off with a catheter. And when this was necessary, it could only be done with a very small catheter, and not without much pain and difficulty. His appetite began to fail him; he had loss of strength, violent pain in the loins, anus, testicles, thighs and legs, giddiness and an intense pricking all over the body, with straining to make water. He assured me that for many months he was not able to get more than twenty minutes' sleep at a time: he voided in his urine a great quantity of yellowish red sand. Mr. G. continued in this state till I first saw him: on passing a small sound, I found a firm stricture at the membranous portion of the urethra, and very close behind the contraction the instrument struck against some calculi. The indication of treatment appeared to be, to dilate the stricture, so as to allow if possible of the exit of the particles of stone, or to admit the introduction of a forceps, by means of which the calculi might be extracted. I tried an instrument on the construction of the bullet-forceps, and succeeded in removing many small particles of stone; but others still remained,

which appeared to be encysted and could not be displaced. Sir Astley Cooper made two or three attempts with the urethral forceps, but they were unsuccessful ; he then recommended that the calculi should be removed as in the lateral operation for stone, to which the patient consented : thirteen calculi of various sizes were removed ; these were situated in a cyst, just anterior to the prostate, but a little on one side of it ; the calculi were composed of phosphate of lime. The patient recovered very well from the operation, and had no return of the calculous formations.

Plate I.



DESCRIPTION OF THE PLATES.

PLATE I.

IN this plate, the whole of the mucous membrane is destroyed, and the bladder diminished in size. The prostate is not diseased. The patient was fifty-six years of age, and had laboured under the disease three years.

PLATE II.

THIS plate represents the bladder taken from a man who had suffered for some years from chronic inflammation of the mucous membrane of this viscus, produced by stricture. The muscular fibres of the bladder are in a state of hypertrophy, and the mucous membrane is, to a great extent, destroyed.

Plate II.



Plate III.



PLATE III.

THIS plate shows the enlargement of the middle lobe and its projection into the bladder. This specimen was taken from a gentleman sixty-three years of age, who had suffered from irritable bladder and difficulty in passing urine. These symptoms were relieved by the occasional introduction of the catheter. The patient died of apoplexy.

PLATE IV.

THIS plate shows enlargement of the lateral lobes, and incipient increase in size of the middle lobe. A bar or ridge is formed at the neck of the bladder, through which a false passage had been made by the introduction of the catheter. The bladder is increased in size, and its muscular fibres considerably thickened. The patient from whom this specimen was taken was near seventy years of age, and had suffered for some time before his death from vesical catarrh, the result of the prostatic enlargement.

Plate IV



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